



# dronacharya

FOR  
**CA INTERMEDIATE**

2024

## Marathon Part 2

**Cost & Management  
Accounting**

**Lecture – 02**

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# Topics *to be covered*

1. Service Costing ✓
2. Process Costing ✓
3. Joint & By-Product ✓
4. Marginal Costing ✓
5. Budget & Budgetary Control ✓
6. Standard Costing ✓

# SERVICE COSTING - CONCEPTS

## 1. Service Costing

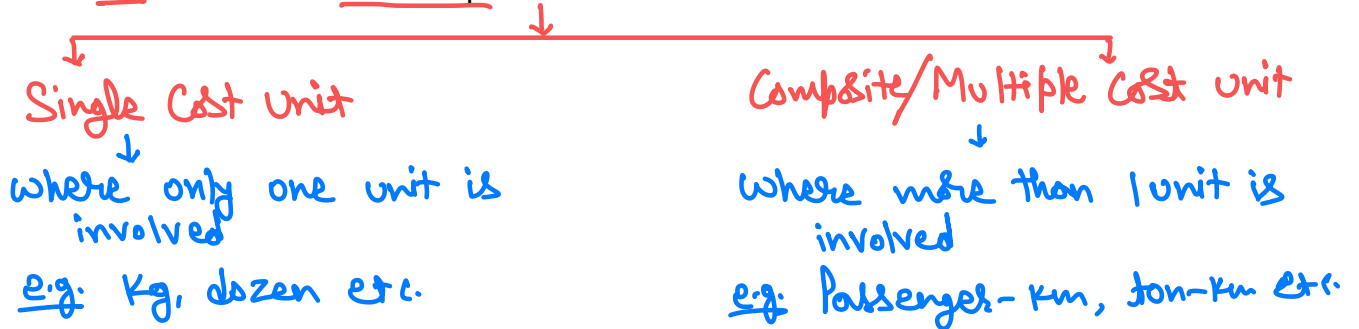
It can be internally or externally.

Industries will have high fixed cost than variable cost

Requires huge investment and comparatively less variable cost

## 2. Cost Unit

The terms in which costs are expressed.



## 3. Cost Unit in case of Trucks / Lorries

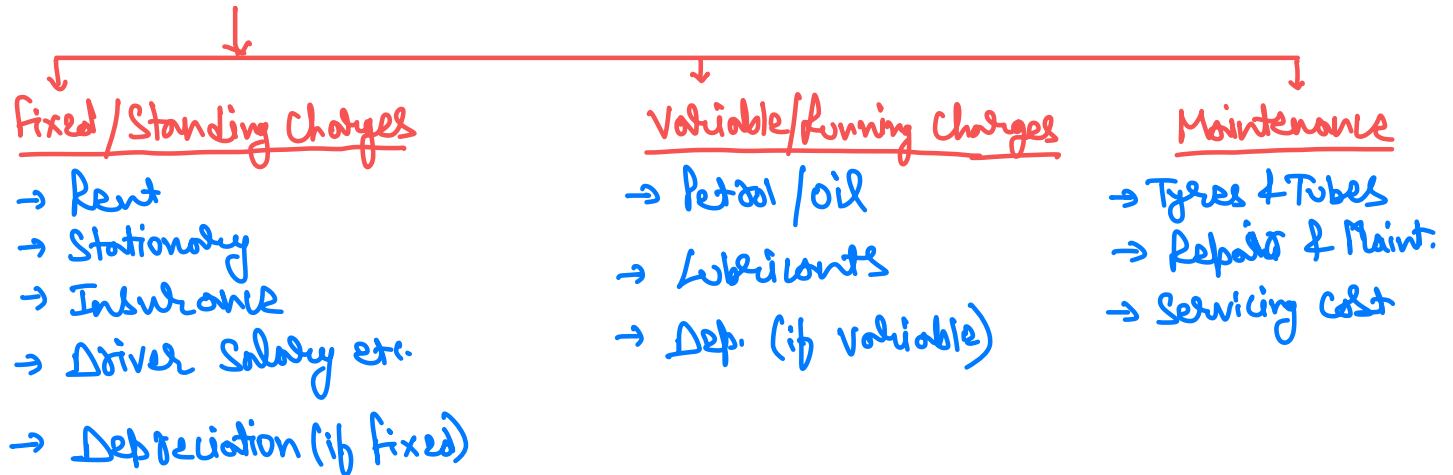
A) Absolute ton-km = Actual kms × Actual tons

B) Commercial ton-km = Actual kms × Average tons

4. Effective Cost Unit = Total units - Normal loss  
Travel w/o Passenger or goods etc.

④ Strike is an abnormal loss so shouldn't be deducted from above.

## 5. Total Cost

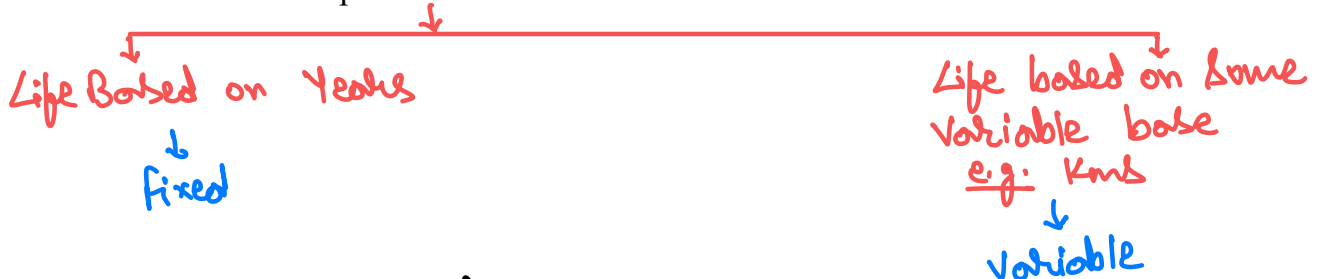


6. Cost Per Unit = 
$$\frac{\text{Total Cost}}{\text{Effective Cost Unit}}$$

## 7. Points To Remember (PTRs)

Petrol, oil and similar charges are always on the basis of actual km travel

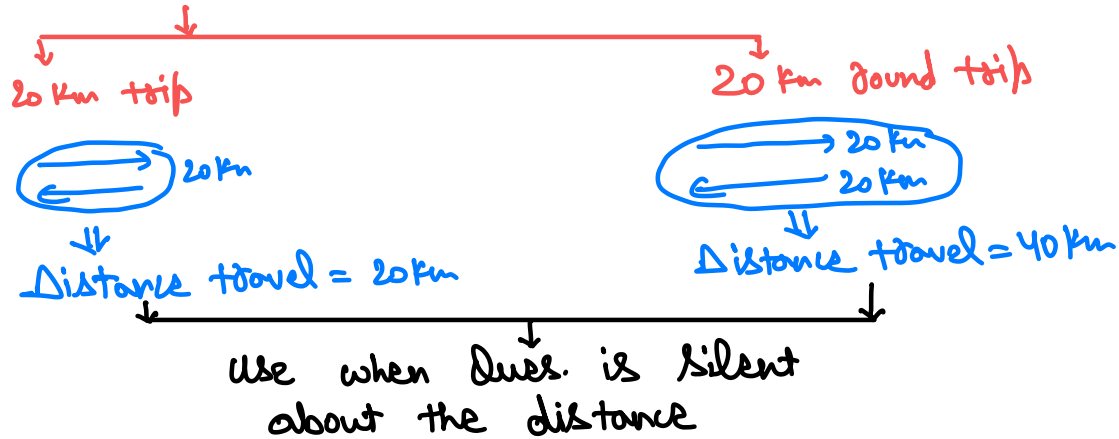
### Treatment of Depreciation



- ⊛ Service Cost of Rs. 2000 after every 3000 km.
- Actual Kms travel ① 3500 km ② 8500 km
- No. of Service =  $\frac{3500}{3000} = 1.16$  ① 1  $TC = 1 \times 2000 = \text{Rs. } 2000$
- No. of Service =  $\frac{8500}{3000} = 2.83$  ② 2  $TC = 2 \times 2000 = \text{Rs. } 4000$

## Treatment of Distance

Mr. X travels



In case of different charges for different categories of service, use the concept of equivalent unit of services.

# SERVICE COSTING – QUESTIONS

## Question – 1

Mr. S owns a bus which runs according to the following schedule:

- (a) Delhi to Panchkula and back, the same day

Distance covered: 150 kms one way

Number of days run each month: 8

Seating capacity occupied 90%

- (b) Delhi to Mathura and back, the same day

Distance covered: 120 kms one way

Number of days run each month: 10

Seating capacity occupied 85%

- (c) Delhi to Alwar and back, the same day

Distance covered: 270 kms one way

Number of days run each month: 6

Seating capacity occupied 100%

- (d) Following are the other details:

Cost of the bus

₹ 6,00,000 ✓

Salary of the driver

₹ 2,800 p.m. ✓

Salary of the conductor

₹ 2,200 p.m. ✓

Salary of the part-time accountant

₹ 200 p.m. ✓

Insurance of the bus

₹ 4,800 p.a.

Diesel consumption 4 kms per litre

→ ₹ 6 per litre

$$\left(\frac{1}{4} \times 20\%\right) \times 6 = \checkmark$$

Road tax

₹ 1,500 p.a.

Lubricant oil

₹ 10 per 100 kms

Permit fee

₹ 315 p.m. ✓

Repairs and maintenance

₹ 1,000 p.m. ✓

Depreciation of the bus

@ 20% p.a. ✓

Seating capacity of the bus

50 persons

Passenger tax is 20% of the total takings. Calculate the bus fare to be charges from each passenger to earn a profit of 30% on total takings. The fares are to be indicated per passenger for the journeys:

- (i) Delhi to Panchkula; (ii) Delhi to Mathura; and (iii) Delhi to Alwar

## Solution

### Calculation of Passenger Kms

|                     | No. | × | Kms          | × | Passenger | = | Passenger Kms |
|---------------------|-----|---|--------------|---|-----------|---|---------------|
| → Delhi – Panchkula | ✓ 1 | × | 150 × 2 × 8  | × | 50 × 90%  | = | 1,08,000 ✓    |
| → Delhi – Mathura   | 1   | × | 120 × 2 × 10 | × | 50 × 85%  | = | 1,02,000 ✓    |
| → Delhi – Alwar     | 1   | × | 270 × 2 × 6  | × | 50 × 100% | = | 1,62,000 ✓    |

↓  
Kms travel =

Total

3,72,000

$$\text{Kms travel} = (1 \times 150 \times 2 \times 8) + (1 \times 120 \times 2 \times 10) + (1 \times 270 \times 2 \times 6) = 8,040 \text{ kms}$$

### Statement of Operating Cost

| Particulars                                       | Amount (₹) |
|---------------------------------------------------|------------|
| <b>Fixed Cost:</b>                                |            |
| Depreciation $(6,00,000 \times 20\% \times 1/12)$ | 10,000     |
| Driver salary                                     | 2,800      |
| Conductor Salary                                  | 2,200      |
| Accountant salary                                 | 200        |
| Insurance $(4,800 \times 1/12)$                   | 400        |
| Road Tax $(1,500 \times 1/12)$                    | 125        |
| Permit Fee                                        | 315        |
| Total Fixed Cost (A)                              | 16,040     |
| <b>Variable Cost:</b>                             |            |
| Diesel $[8,040 \times (6/4)]$                     | 12,060     |
| Lubricating oil $[8,040 \times (10/100)]$         | 804        |
| Total Variable Cost (B)                           | 12,864     |
| <b>Maintenance Cost:</b>                          |            |
| Repair & Maintenance                              | 1,000      |
| Total Maintenance Cost (B)                        | 1,000      |
| Total Cost (A + B + C)                            | 29,904     |
| (+) Passenger tax $(59,808 \times 20\%)$          | 11,962     |
| (+) Profit $(59,808 \times 30\%)$                 | 17,942     |
| Total Takings $(29,904 \div 50\%)$                | 59,808     |
| Effective Passenger km                            | 3,72,000   |
| Takings per effective passenger km                | 0.16       |

### Fares per passenger for the journey

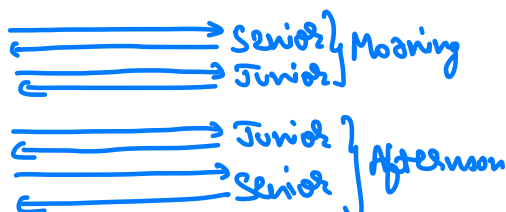
$$\text{Delhi to Panchkula} = 150 \times 0.16 = ₹ 24$$

$$\text{Delhi to Mathura} = 120 \times 0.16 = ₹ 19.20$$

$$\text{Delhi to Alwar} = 270 \times 0.16 = ₹ 43.20$$

### Question – 2

SK is a public school having five buses each plying on different directions for the transport of its school students. In view of a large number of students available of the bus service the buses work two shifts daily both in the morning and in afternoon. The buses are garaged in the school. The work load of the students has been so arranged that in the morning the first trip picks up the senior students and the second trip plying an hour later picks up the junior students. Similarly, in the afternoon the first trip picks the junior students and an hour later the second trip takes the senior student home.



Total 8 rounds in a day

$$\text{Distance in a day} = 8 \times 8 = 64 \text{ km}$$

$$\text{Distance in a month} = 64 \times 25 = 1600 \text{ km}$$

$$\text{Distance per km} = 1600 \times 9 = 14400 \text{ km}$$

The distance travelled by each bus one way is 8 kms. The school works 25 days in a month and remains closed for the vacation in May, June and December. Bus fee however is payable by the students for all the 12 months of the year.

The details of expenses for a year are as under:

Drivers' salary  $\rightarrow$  ₹ 450 per month per driver

Cleaners' salary  $\rightarrow$  ₹ 350 per month

(Salary payable for 12 months and one cleaner employed for all the five buses)

License fee, taxes etc. ₹ 860 per bus per annum

Insurance ₹ 1,000 per bus p.a.

Repairs and maintenance ₹ 3,500 per bus p.a.

Purchase price of bus (life 12 years) ₹ 1,50,000 each

Scrap value ₹ 30,000

Diesel cost  $\rightarrow$  ₹ 2.00 per litre

$$\frac{2}{4} \times 14400 = 7200$$

Each bus gives an average mileage of 4 km per liter of diesel.

Seating capacity of each bus is 50 students. The seating capacity is fully occupied during the whole year. Students picked up and dropped within a range upto 4 km of distance from the school are charged half fare and fifty percent of students travelling in each trip are in this category. Ignore interest since the charges are to be based on average cost.

You are required to:

- Prepare a statement showing the expenses of operating a single bus and the fleet of five buses for a year.
- Work out the average cost per student per month in respect of
  - Students coming from a distance of upto 4 km from the school and
  - Students coming from a distance of beyond 4 km from the school

### Solution

#### (a) Statement of Cost

| Particulars          | 1 bus                                  | 5 buses                    |
|----------------------|----------------------------------------|----------------------------|
| Driver salary        | $450 \times 12 = 5,400$                | $5,400 \times 5 = 27,000$  |
| Cleaner salary       | $4,200 \div 5 = 840$                   | $350 \times 12 = 4,200$    |
| License etc.         | 860                                    | $860 \times 5 = 4,300$     |
| Insurance            | 1,000                                  | $1,000 \times 5 = 5,000$   |
| Repair & Maintenance | 3,500                                  | $3,500 \times 5 = 17,500$  |
| Depreciation         | $(1,50,000 - 30,000) \div 12 = 10,000$ | $10,000 \times 5 = 50,000$ |
| Diesel (w.n. - 1)    | 7,200                                  | $7,200 \times 5 = 36,000$  |
| <b>Total</b>         | <b>28,800</b>                          | <b>1,44,000</b>            |

#### Working note 1

Number of round trips in a day = 8

Total kms in a day =  $8 \times 8 = 64$

Total kms per annum =  $64 \times 25 \times 9 = 14,400$

Diesel cost per annum per bus =  $14,400 \times (2/4) = ₹ 7,200$

(b) Number of students from whom bus fee is receivable = 100

Half fee students per bus =  $100 \times 50\% = 50$

Full fee students per bus =  $100 \times 50\% = 50$

Full fee students equivalent to half fee students =  $50 \times 2 = 100$

Total equivalent half fee students =  $50 + 100 = 150$

Total cost per bus per annum = ₹ 28,800

Total cost per bus per month =  $28,800 \div 12 = ₹ 2,400$

Total cost per month per half fee students =  $2,400 \div 150 = ₹ 16$

Total cost per month per full fee students =  $16 \times 2 = ₹ 32$

### Question – 3

A company is considering three alternative proposals for conveyance facilities for its sales personnel who have to do considerable travelling, approximately 20,000 kms every year. The proposals are as follows:

- Purchase and maintain its own fleet of cars. The average cost of a car is ₹ 1,00,000
- Allow the executive use his own car and reimburse expenses at the rate of ₹ 1.60 paise per kilometer and also bear insurance costs.
- Hire cars from an agency at ₹ 20,000 per year per car. The company will have to bear costs of petrol, taxes and tyres.

The following further details are available:

- Petrol ₹ 0.60 per km
- Repairs and maintenance ₹ 0.20 per km
- Tyre ₹ 0.12 per km
- Insurance ₹ 1,200 per car per annum;
- Taxes ₹ 800 per car per annum
- Life of the car: 5 years with annual mileage of 20,000 kms
- Resale value: ₹ 20,000 at the end of the fifth year
- Work out the relative costs of three proposals and rank them.

### Solution

| Particulars                                   | Own car  | Executive car | Hire car |
|-----------------------------------------------|----------|---------------|----------|
| <b>Fixed Cost:</b>                            |          |               |          |
| Depreciation [ $(1,00,000 - 20,000) \div 5$ ] | ✓ 16,000 | -             | -        |
| Insurance                                     | ✓ 1,200  | ✓ 1,200       | -        |
| Taxes                                         | ✓ 800    | -             | ✓ 800    |
| Hire charges                                  | -        | -             | ✓ 20,000 |
| Total Fixed cost                              | ✓ 18,000 | → 1,200       | → 20,800 |

| Particulars                      | Own car  | Executive car | Hire car |
|----------------------------------|----------|---------------|----------|
| Kms travel                       | → 20,000 | 20,000        | 20,000   |
| Fixed cost per km (A)            | 0.90     | → 0.06        | 1.04     |
| <b>Variable Cost per km:</b>     |          |               |          |
| Petrol                           | ✓ 0.60   | -             | ✓ 0.60   |
| Repair & Maint.                  | ✓ 0.20   | -             | -        |
| Tyres                            | ✓ 0.12   | -             | ✓ 0.12   |
| Reimbursement                    | -        | ✓ 1.60        | -        |
| Total variable cost per km (B)   | 0.92     | 1.60          | 0.72     |
| <b>Total cost per km (A + B)</b> | 1.82     | 1.66          | 1.76     |
| <b>Rank</b>                      | III      | I             | II       |

#### Question – 4

Mr. SK now spends ₹ 0.90 per km on taxi for his clients' work. He is considering two other alternatives, the purchase of a new nano car or an old innova car. The estimated cost figures are:

| Items                              | New Nano Car | Old Innova car |
|------------------------------------|--------------|----------------|
| Purchase price                     | 35,000       | 20,000         |
| Sale price, after 5 years          | 19,000       | 12,000         |
| Repairing and servicing, per annum | 1,000 ✓      | 1,200 ✓        |
| Taxes and Insurance per annum      | 1,700 ✓      | 700 ✓          |
| Petrol consumption per litre       | 10 km        | 7 km           |
| Petrol price per litre             | 3.50         | 3.50           |

He estimates that he goes 10,000 km annually. Which of the three alternatives will be cheaper? If his practice expands and he has to go 19,000 km per annum, what should be his decision? At how many kms per annum will the cost of the two cars break even and why? Assume petrol only as variable cost. Ignore interest and income tax.

#### Solution

##### Statement of operating cost

| Particulars           | New Nano Car ✓                       | Old Innova car ✓                     | Taxi ✓                       |
|-----------------------|--------------------------------------|--------------------------------------|------------------------------|
| <b>Fixed cost:</b>    |                                      |                                      |                              |
| Depreciation          | $(35,000 - 19,000) \div 5 = 3,200$ ✓ | $(20,000 - 12,000) \div 5 = 1,600$ ✓ | -                            |
| Repairs               | 1,000 ✓                              | 1,200 ✓                              | -                            |
| Taxes and Insurance   | 1,700 ✓                              | 700 ✓                                | -                            |
| Total Fixed cost (A)  | 5,900                                | 3,500                                | -                            |
| <b>Variable Cost:</b> |                                      |                                      |                              |
| Petrol                | $10,000 \times (3.50/10) = 3,500$ ✓  | $10,000 \times (3.50/7) = 5,000$ ✓   | -                            |
| Fare                  | -                                    | -                                    | $0.90 \times 10,000 = 9,000$ |

|                         |       |       |       |
|-------------------------|-------|-------|-------|
| Total Variable cost (B) | 3,500 | 5,000 | 9,000 |
| Total cost (A + B)      | 9,400 | 5,000 | 9,000 |

∴ Recommended to purchase old Innova car for travel upto 10,000 kms.

#### Statement of operating cost

| Particulars         | New Nano Car                      | Old Innova car                   | Taxi                          |
|---------------------|-----------------------------------|----------------------------------|-------------------------------|
| Total Fixed cost    | 5,900                             | 3,500                            | -                             |
| Total variable cost | $19,000 \times (3.50/10) = 6,650$ | $19,000 \times (3.50/7) = 9,500$ | $0.90 \times 19,000 = 17,100$ |
| Total cost          | 12,550                            | 13,000                           | 17,100                        |

∴ Recommended to purchase new Nano car for travel upto 19,000 kms.

Let at 'y' kms, cost of the two options will become equal.

Total cost of New Nano car = Total cost of Old Innova car

$$5,900 + (y)(3.5/10) = 3,500 + (y)(3.5/7)$$

$$y = 16,000 \text{ kms}$$

#### Question – 5

Navya LMV Pvt. Ltd., operates cab/car rental service in Delhi/NCR. It provides its service to the offices of Noida, Gurugram and Faridabad. At present it operates CNG fueled cars but it is also considering to upgrade these into Electric vehicles (EV). The details related with the owning of CNG & EV propelled cars are as tabulated below:

| Particulars                                   | CNG Car  | EV Car            |
|-----------------------------------------------|----------|-------------------|
| Car purchase price (₹)                        | 9,20,000 | 15,20,000         |
| Govt. subsidy on purchase of car (₹)          | -        | 1,50,000          |
| Life of the car                               | 15 years | 10 years          |
| Residual value (₹)                            | 95,000   | 1,70,000          |
| Mileage                                       | 20 km/kg | 240 km per charge |
| Electricity consumption per full charged      | -        | 30 Kwh            |
| CNG cost per Kg (₹)                           | 60       | -                 |
| Power cost per Kwh (₹)                        | -        | 7.60              |
| Annual Maintenance cost (₹)                   | 8,000    | 5,200             |
| Annual insurance cost (₹)                     | 7,600    | 14,600            |
| Tyre replacement cost in every 5 year (₹)     | 16,000   | 16,000            |
| Battery replacement cost in every 8 years (₹) | 12,000   | 5,40,000          |

Apart from the above, the following are the additional information:

| Particulars                                  |             |
|----------------------------------------------|-------------|
| Average distance covered by a car in a month | 1,500 km    |
| Driver's salary (₹)                          | 20,000 p.m. |
| Garage rent per car (₹)                      | 4,500 p.m.  |

|                                                     |                |
|-----------------------------------------------------|----------------|
| Share of office and administration cost per car (₹) | → 1,500 p.m. ✓ |
|-----------------------------------------------------|----------------|

Required to calculate the operating cost of vehicle per month per car for both CNG & EV option.

### Solution

#### **Working Notes:**

#### **1. Calculation of Depreciation per month**

|   | Particulars                                           | CNG Car    | EV Car       |
|---|-------------------------------------------------------|------------|--------------|
| A | Car Purchase price (₹)                                | ✓ 9,20,000 | 15,20,000    |
| B | Less: Govt. Subsidy                                   | -          | ✓ (1,50,000) |
| C | Less: Residual value (₹)                              | ✓ (95,000) | ✓ (1,70,000) |
| D | Depreciation value of car (₹) (A – B – C)             | 8,25,000   | → 12,00,000  |
| E | Life of the car                                       | → 15 years | → 10 years   |
| F | Depreciation per month (₹) [ $D \div (E \times 12)$ ] | 4,583.33   | 10,000       |

#### **2. Fuel/Electricity consumption per month**

|   | Particulars                                  | CNG Car          | EV Car  |
|---|----------------------------------------------|------------------|---------|
| A | Average distance covered in a month          | → 1,500          | → 1,500 |
| B | Mileage (KM)                                 | → 20             | → 240   |
| C | Quantity of CNG/Full charge required (A × B) | → 75 kg          | 6.25    |
| D | Electricity consumption (C × 30 Kwh)         | -                | 187.5   |
| E | Cost of CNG per kg (₹)                       | 60               | -       |
| F | Power cost per Kwh (₹)                       | -                | 7.60    |
| G | CNG Cost per month (₹) (C × E)               | 1500 × 5 = 4,500 | -       |
| H | Power cost per month (₹) (D × F)             | -                | 1,425   |

0.95 × 1500

#### **3. Amortized cost of Tyre replacement**

|   | Particulars                                   | CNG Car   | EV Car   |
|---|-----------------------------------------------|-----------|----------|
| A | Life of vehicle                               | 15 years  | 10 years |
| B | Replacement interval                          | 5 years   | 5 years  |
| C | No. of time replacement required              | → 2 times | → 1 time |
| D | Cost of tyres for each replacement (₹)        | → 16,000  | 16,000   |
| E | Total replacement cost (₹) (C × D)            | → 32,000  | 16,000   |
| F | Cost per month (₹) [ $E \div (A \times 12)$ ] | 177.78    | 133.33   |

#### **4. Amortized cost of Battery replacement**

|   | Particulars                      | CNG Car    | EV Car     |
|---|----------------------------------|------------|------------|
| A | Life of vehicle                  | → 15 years | → 10 years |
| B | Replacement interval             | 8 years    | 8 years    |
| C | No. of time replacement required | 1 time     | 1 time     |

|   |                                          |          |            |
|---|------------------------------------------|----------|------------|
| D | Cost of battery for each replacement (₹) | ✓ 12,000 | ✓ 5,40,000 |
| E | Total replacement cost (₹) (C × D)       | → 12,000 | 5,40,000   |
| F | Cost per month (₹) [E ÷ (A × 12)]        | 66.67    | 4,500      |

### Statement of Operating Cost

| Particulars                                              | CNG Car (₹)        | EV Car (₹)       |
|----------------------------------------------------------|--------------------|------------------|
| <b>Fixed Cost:</b>                                       |                    |                  |
| Depreciation (working note - 1)                          | ✓ 4,583.33         | 10,000           |
| Driver's Salary                                          | ✓ 20,000           | 20,000           |
| Garage rent                                              | ✓ 4,500            | 4,500            |
| Total Fixed Cost (A)                                     | 30,583.33          | 36,000           |
| <b>Variable Cost:</b>                                    |                    |                  |
| Fuel cost/ power cost (Working note – 2)                 | ✓ 4,500            | 1,425            |
| Total Variable Cost (B)                                  | 4,500              | 1,425            |
| <b>Maintenance Cost:</b>                                 |                    |                  |
| Annual maintenance cost                                  | → 666.67           | 433.33           |
| Annual insurance cost                                    | → 633.33           | 1,216.67         |
| Amortized cost of tyres replacement (working note – 3)   | ✓ 177.78           | 133.33           |
| Amortized cost of battery replacement (working note – 4) | ✓ 66.67            | 4,500            |
| Total Maintenance Cost (C)                               | 1,544.45           | 62,83.33         |
| <b>Operating cost per month (A + B + C)</b>              | → <b>36,627.78</b> | <b>43,708.33</b> |

### Question – 6

SK Transport Ltd. charges ₹ 90 per ton for its 6 tons truck lorry load from city 'A' to city 'B'. The charges for the return journey are ₹ 84 per ton. No concession or reduction in these rates is made for any delivery of goods at intermediate station 'C'. In January, the truck made 12 outward journeys for city 'B' with full load out of which 2 ton were unloaded twice in the way at city 'C'. The truck carried a load of 8 tons in its return journey for 5 times but once caught by police and ₹ 1,200 was paid as fine. For the remaining trips the truck carried full load out of which all the goods on load were unloaded once at city 'C'.

The distance from city 'A' to city 'C' and city 'B' are 140 kms and 300 kms respectively. Annual fixed cost and maintenance charges are ₹ 60,000 and ₹ 12,000 respectively. Running charges spent during January, are ₹ 2,944. You are required to find out the cost per absolute ton-km and the profit for January.

### Solution

#### Calculation of Ton Kms

|        |     |   |     |   |     |   |          |
|--------|-----|---|-----|---|-----|---|----------|
|        | No. | × | Kms | × | Ton | = | Ton Kms  |
| A to B | 10  | × | 300 | × | 6   | = | 18,000 ✓ |

✓ 10 time A → 300km B  
6 ton  
2 time A → 140km C → 160km B  
6 ton 4 ton  
12

5 time A ← 300 B  
8 ton  
1 time A ← 140 C ← 160 B  
6 ton 4 ton  
6 time A ← 300 B  
6 ton  
12

|          |          |   |            |   |              |   |               |
|----------|----------|---|------------|---|--------------|---|---------------|
| → A to C | <u>2</u> | × | <u>140</u> | × | <u>6</u>     | = | 1,680         |
| → C to B | <u>2</u> | × | <u>160</u> | × | <u>4</u>     | = | 1,280         |
| → B to A | <u>5</u> | × | <u>300</u> | × | <u>8</u>     | = | 12,000        |
| → B to C | <u>1</u> | × | <u>160</u> | × | <u>6</u>     | = | 960           |
| → C to A | <u>1</u> | × | <u>140</u> | × | <u>0</u>     | = | 0             |
| → B to A | <u>6</u> | × | <u>300</u> | × | <u>6</u>     | = | 10,800        |
|          |          |   |            |   | <b>Total</b> | = | <u>44,720</u> |

#### Statement of operating cost

| Particulars                              | Amount (₹)  |
|------------------------------------------|-------------|
| Fixed charges ( $60,000 \div 12$ )       | 5,000       |
| Maintenance charges ( $12,000 \div 12$ ) | 1,000       |
| Running charges                          | 2,944       |
| Total Cost                               | 8,944       |
| Ton-Km                                   | 44,720      |
| Total cost per ton-km                    | <u>0.20</u> |

#### Statement of Profit

| Particulars            |                                   | Amount (₹)   |
|------------------------|-----------------------------------|--------------|
| <b>Revenue:</b>        |                                   |              |
| Outward                | → $10 \times 6 \times 90 = 5,400$ |              |
|                        | → $2 \times 6 \times 90 = 1,080$  |              |
| Return                 | → $5 \times 8 \times 84 = 3,360$  |              |
|                        | → $1 \times 6 \times 84 = 504$    |              |
|                        | → $6 \times 6 \times 84 = 3,024$  |              |
|                        |                                   | → 13,368     |
| Less: Total cost       |                                   | → (8,944)    |
| Less: Fine & Penalties |                                   | → (1,200)    |
| Profit                 |                                   | <u>3,224</u> |

#### Question – 7

A transport company has a fleet of three trucks of 10 tonnes, capacity each plying in different directions for transport of customer goods. The trucks run loaded with goods and return empty. The distance travelled, number trips made and the load carried per day by each truck are as under:

| Truck No. | One way distance (Km) | No. of trips per day | Load carried per trip per day (tonnes) |
|-----------|-----------------------|----------------------|----------------------------------------|
| 1         | 16                    | 4                    | 6                                      |
| 2         | 40                    | 2                    | 9                                      |
| 3         | 30                    | 3                    | 8                                      |

The analysis of maintenance cost and the total distance traveled during the last two years is as under:

| Year | Total distance traveled | Maintenance cost ₹ |
|------|-------------------------|--------------------|
| 1    | 1,60,200                | 46,050             |

2

1,56,700

45,175

The following are the details of expenses for the last year under review:

- Diesel : ₹ 10 per litre. Each liter gives 4 km per litre of diesel on average
- Driver Salary → : ₹ 2,000 per month
- License and taxes → : ₹ 5,000 per annum per truck
- Insurance : ₹ 5,000 per annum for all 3 vehicles
- Purchase price per truck : ₹ 3,00,000, Life 10 years, Scrap value at the end of life \ is ₹ 10,000
- Oil and sundries : ₹ 25 per 100 km run
- General overhead : ₹ 11,084 per annum

The vehicles operate 24 days per month on an average

Required:

- (a) Prepare an Annual Cost Statement covering the fleet of three vehicles
- (b) Calculate the cost per Km run ✓
- (c) Determine the freight rate per tonne km to yield a profit of 10% on freight

### Solution

#### Calculation of Ton Kms

| Truck No. | No. | × | Kms                               | × | Ton | = | Ton Kms  |
|-----------|-----|---|-----------------------------------|---|-----|---|----------|
| 1         | 1   | × | $16 \times 4 \times 24 \times 12$ | × | → 6 | = | 1,10,592 |
| ← 1       | 1   | × | $16 \times 4 \times 24 \times 12$ | × | 0 ✓ | = | 0        |
| 2         | 1   | × | $40 \times 2 \times 24 \times 12$ | × | 9   | = | 2,07,360 |
| ← 2       | 1   | × | $40 \times 2 \times 24 \times 12$ | × | 0 ✓ | = | 0        |
| 3         | 1   | × | $30 \times 3 \times 24 \times 12$ | × | 8   | = | 2,07,360 |
| ← 3       | 1   | × | $30 \times 3 \times 24 \times 12$ | × | 0 ✓ | = | 0        |
| Total     |     |   |                                   |   |     | = | 5,25,312 |

Total kms travelled = 1,34,784 kms

(a)

#### Statement of Operating Cost

| Particulars                                                             | Amount (₹) |
|-------------------------------------------------------------------------|------------|
| <b>Fixed Cost:</b>                                                      |            |
| Driver salary ( $2,000 \times 12 \times 3$ )                            | ✓ 72,000   |
| License and tax ( $5,000 \times 3$ )                                    | ✓ 15,000   |
| Insurance                                                               | → 5,000    |
| Depreciation $\left[ \frac{(3,00,000 - 10,000)}{10} \times 3 \right]$ ✓ | → 87,000   |
| General overheads                                                       | → 11,084   |
| Total Fixed Cost (A)                                                    | → 1,90,084 |
| <b>Variable Cost:</b>                                                   |            |

| Particulars                                   | Amount (₹) |
|-----------------------------------------------|------------|
| Diesel [ $1,34,784 \times (10/4)$ ]           | 3,36,960   |
| Oil & Sundries [ $1,34,784 \times (25/100)$ ] | 33,696     |
| Total Variable Cost (B)                       | 3,70,656   |
| <b>Maintenance Cost:</b>                      |            |
| Maintenance Cost (working note – 1)           | 39,696     |
| Total Maintenance Cost (B)                    | 39,696     |
| Total Cost (A + B + C)                        | 6,00,436   |

### Working Note 1

$$\text{Variable maintenance cost per km} = \frac{\text{Difference in total cost}}{\text{Difference in kms}} = \frac{46,050 - 45,175}{1,60,200 - 1,56,700} = ₹ 0.25$$

$$\text{Fixed maintenance cost} = \text{Total cost} - \text{Variable cost} = 45,175 - (1,56,700)(0.25) = ₹ 6,000$$

$$\text{Maintenance cost} = \text{Fixed cost} + \text{variable cost} = 6,000 + (1,34,784)(0.25) = ₹ 39,696$$

$$(b) \text{ Total cost per km} = \frac{\text{Total cost}}{\text{Kms}} = \frac{6,00,436}{1,34,784} = ₹ 4.45$$

$$(90) (c) \text{ Cost per ton-km} = \frac{(6,00,436)}{1,34,784} = 1.143$$

$$(10) \text{ Profit per ton-km} = (1.27 \times 10\%) = 0.127$$

$$(100) \text{ Freight per ton-km} = (1.143 \div 90\%) = 1.270$$

### Question – 8

SK Hospital runs a Critical Care Unit (CCU) in a hired building. CCU consists of 35 beds and 5 more beds can be added, if required.

- Rent per month - ₹ 75,000 ✓
- Supervisors (2 persons) - ₹ 25,000 per month – each
- Nurse (4 persons) - ₹ 20,000 per month – each
- Ward Boys (4 persons) - ₹ 5,000 per month – each

Doctors paid ₹ 2,50,000 per month – paid on the basis of number of patients attended and the time spent by them.

Other expenses for the year are as follows:

- Repair (Fixed) - ₹ 81,000 ✓
- Food to patients (variable) ✓ - ₹ 8,80,000
- Other services to patients (variable) - ₹ 3,00,000 ✓
- Laundry charges (variable) - ₹ 6,00,000 ✓
- Medicines (variable) - ₹ 7,50,000 ✓
- Other fixed expenses - ₹ 10,80,000 ✓
- Administration expenses allocated - ₹ 10,00,000 ✓

$$(35 \times 150) + (80 \times 25) + 750 = 8000$$

It was estimated that for 150 days in a year 35 beds are occupied and for 80 days only 25 beds are occupied.

The hospital hired 750 beds at a charge of ₹ 100 per bed per day, to accommodate the flow of patients. However, this does not exceed more than 5 extra beds over and above the normal capacity of 35 beds on any day.

You are required to:

- Calculate profit per patient day, if the hospital recovers on an average ₹ 2,000 per day from each patient.
- Find out breakeven point for the hospital.

### Solution

(a) Effective bed days =  $(150 \times 35) + (80 \times 25) + 750 = 8,000$

### Statement of Profit

| Particulars                                      | Amount (₹)         |
|--------------------------------------------------|--------------------|
| <b>Variable Cost:</b>                            |                    |
| Doctor cost $(2,50,000 \times 12)$               | 30,00,000          |
| Food to patients                                 | 8,80,000           |
| Other services to patients                       | 3,00,000           |
| Laundry charges                                  | 6,00,000           |
| Medicines                                        | 7,50,000           |
| Bed Charges $(750 \times 100)$                   | 75,000             |
| <b>Total Variable Cost (A)</b>                   | <b>56,05,000</b>   |
| <b>Fixed Cost:</b>                               |                    |
| Rent $(75,000 \times 12)$                        | 9,00,000           |
| Supervisor $(25,000 \times 12 \times 2)$         | 6,00,000           |
| Nurse $(20,000 \times 12 \times 4)$              | 9,60,000           |
| Ward boys $(5,000 \times 12 \times 4)$           | 2,40,000           |
| Repair                                           | 81,000             |
| Other fixed expenses                             | 10,80,000          |
| Administration expenses                          | 10,00,000          |
| <b>Total Fixed Cost (B)</b>                      | <b>48,61,000</b>   |
| <b>Total Cost (A + B)</b>                        | <b>1,04,66,000</b> |
| <b>Revenue <math>(8,000 \times 2,000)</math></b> | <b>1,60,00,000</b> |
| <b>Profit</b>                                    | <b>55,34,000</b>   |

Profit per patient day =  $\frac{55,34,000}{8,000} = ₹ 691.75$

(b) Contribution = Revenue – Variable cost = ₹ 1,60,00,000 – ₹ 56,05,000 = ₹ 1,03,95,000

Contribution per patient day =  $\frac{1,03,95,000}{8,000} = ₹ 1,299.375$

Break-even point =  $\frac{\text{Fixed cost}}{\text{Contribution per patient day}} = \frac{48,61,000}{1,299.375} = 3,741 \text{ patient days}$

### Question – 9

SEZ Ltd. built a 120 km long highway and now operates a toll road to collect tolls. The company has invested ₹ 900 crore to build the road and has estimated that a total of 120 crore vehicles will be using the highway during the 10 years toll collection tenure. The other costs for the month of 'June 2020' are as follows:

(i) Salary”

- Collection personnel (3 shifts and 5 persons per shift) - ₹ 200 per day per person.
- Supervisor (3 shifts and 2 persons per shift) - ₹ 350 per day per person
- Security personnel (2 shifts and 2 persons per shift) - ₹ 200 per day per person
- Toll Booth Manager (3 shifts and 1 person per shift) - ₹ 500 per day per person

(ii) Electricity - ₹ 1,50,000

(iii) Telephone - ₹ 1,00,000

(iv) Maintenance cost - ₹ 50 lakhs

(v) The company needs 30% profit over total cost.

Required:

- (1) Calculate cost per kilometer
- (2) Calculate the toll rate per vehicle

### Solution

(1) **Statement of Cost**

| Particulars                                                                          | Amount (₹)  |
|--------------------------------------------------------------------------------------|-------------|
| <b>Capital Cost:</b>                                                                 |             |
| Capital cost share $\left[ \frac{900 \text{ crore}}{10} \times \frac{1}{12} \right]$ | 7,50,00,000 |
| Total Capital Cost (A)                                                               | 7,50,00,000 |
| <b>Operating Cost:</b>                                                               |             |
| Salary – Collection Personnel $(3 \times 5 \times 30 \times 200)$                    | 90,000      |
| - Supervisor $(3 \times 2 \times 30 \times 350)$                                     | 63,000      |
| - Security Personnel $(2 \times 2 \times 30 \times 200)$                             | 24,000      |
| - Toll booth manager $(3 \times 1 \times 30 \times 500)$                             | 45,000      |
| Electricity                                                                          | 1,50,000    |
| Telephone                                                                            | 1,00,000    |
| Total Operating Cost (B)                                                             | 4,72,000    |
| <b>Maintenance Cost:</b>                                                             |             |
| Maintenance                                                                          | 50,00,000   |
| Total Maintenance Cost (C)                                                           | 50,00,000   |
| Total Cost (A + B + C)                                                               | 8,04,72,000 |
| Kms                                                                                  | 120         |
| Total cost per km                                                                    | 6,70,600    |

|                                 |                                                  |                 |
|---------------------------------|--------------------------------------------------|-----------------|
| (2) Vehicles per month          | $= \frac{120,00,00,000}{10} \times \frac{1}{12}$ | $= 1,00,00,000$ |
| Total cost per month            | $\rightarrow = 8,04,72,000$                      |                 |
| Add: Profit (30% × 8,04,72,000) | $\rightarrow = 2,41,41,600$                      |                 |
| Total Revenue                   | $= 10,46,13,600$                                 |                 |
| Vehicles                        | $= 1,00,00,000$                                  |                 |
| Toll per vehicle                | $=$                                              | <u>10.46</u>    |

### Question – 10

A lodging home is being run in a small hill station with 50 single rooms. The home offers concessional rates during six off-season months in a year. During this period, half of the full room rent is charged. The management's profit margin is targeted at 20% of the room rent. The following are the cost estimates and other details for the year ending 31<sup>st</sup> March, (assume a month to be of 30 days):

(a) Occupancy during the season is 80%, while in the off season is 40% only:

(b) Expenses:

₹

|                                              |   |          |
|----------------------------------------------|---|----------|
| (1) Staff Salary (excluding room attendants) | ✓ | 2,75,000 |
| (2) Repairs to Buildings                     | ✓ | 1,30,500 |
| (3) Laundry & Linen                          | ✓ | 40,000   |
| (4) Interior and Tapestry                    | ✓ | 87,500   |
| (5) Sundry Expenses                          | ✓ | 95,400   |

(c) Annual depreciation is to be provided for buildings at 5% and on furniture and equipments at 15% on straight line basis:

(d) Room attendants are paid ₹ 5 per room day on the basis of occupancy of the rooms in a month

(e) Monthly lighting charges are ₹ 120 per room, except in four months of winter when it is ₹ 30 per room and this cost is on the basis of full occupancy for a month, and

(f) Total investment in the home is ₹ 100 lakhs of which ₹ 80 lakhs relate to buildings and balance for furniture and equipments.

You are required to compute the room rent per day both during the season and off season.

### Solution

#### Computation of Effective room days

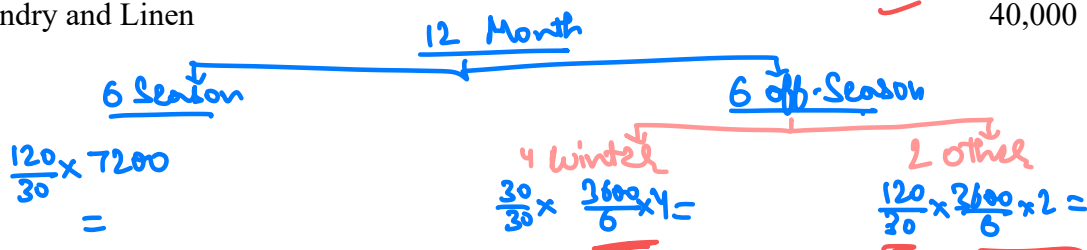
Season = (50 rooms × 80 / 100) × (6 × 30) days =

Off-season = (50 rooms × 40 / 100) × (6 × 30) days =

|               |   |              |
|---------------|---|--------------|
| 7,200         | ✓ | 14400        |
| 3,600         | ✓ | 3600         |
| <u>10,800</u> |   | <u>18000</u> |

#### Computation of Total Cost

|                       |   |          |
|-----------------------|---|----------|
| (1) Salary            | ✓ | 2,75,000 |
| (2) Repairs           | ✓ | 1,30,500 |
| (3) Laundry and Linen | ✓ | 40,000   |



|                                                                      |            |           |
|----------------------------------------------------------------------|------------|-----------|
| (4) Interior Decoration                                              | —          | 87,500    |
| (5) Depreciation                                                     |            |           |
| - Building (5% of 80,00,000)                                         | 4,00,000   |           |
| - Furniture & equipment (15% of 20,00,000)                           | — 3,00,000 | 7,00,000  |
| Sundry Expenses                                                      | →          | 95,400    |
| (6) Attendant's Salary (10,800 × 5)                                  | →          | 54,000    |
| (7) Lighting Charges                                                 |            |           |
| - Season (7,200 days × ₹ 4) [₹ 120 p.m. means ₹ 4 per day]           |            | 28,800    |
| - Off-Season                                                         |            |           |
| Winter [3,600 × 4/6] × ₹ 1 [₹ 30 p.m. means Re.1 per day] (4 months) |            | 2,400     |
| Balance (3,600 × 2/6) × ₹ 4 (2 months)                               |            | 4,800     |
| Total Cost                                                           | →          | 14,18,400 |

### Computation of Total Revenue

|                                                   |   |           |
|---------------------------------------------------|---|-----------|
| Total Cost                                        | ₹ | 14,18,400 |
| (+) Profit (20% of revenue) (14,18,400 × 20/80) - |   | 3,54,600  |
| Total Revenue [14,18,400 ÷ 80%]                   | → | 17,73,000 |

Assume Rent per room per day during Season is ₹ X & during off season is ₹ X/2

Hence, total annual revenue = 7,200 X + 3,600 [X/2] = 9,000 X

Now, 9,000 X = ₹ 17,73,000

X = 197 Hence, Rent per room per day

During Season = X = ₹ 197

During off-season = [X/2] = ₹ [197/2] = ₹ 98.50

$$\text{off-seas. } \frac{17,73,000}{18,000} = 98.50$$

$$\text{Season} = 98.50 \times 2 = 197$$

### Question – 11

ABC Bank is having a branch which is engaged in processing of 'Vehicle Loan' and 'Education Loan' applications in addition to other services to customers. 30% of the overhead costs for the branch are estimated to be applicable to the processing of 'Vehicle Loan' applications and 'Education Loan' applications each.

Branch is having four employees at a monthly salary of ₹ 50,000 each, exclusively for processing of Vehicle Loan applications and two employees at a monthly salary of ₹ 70,000 each, exclusively for processing of Education Loan applications.

In addition to above, following expenses are incurred by the Branch:

- Branch Manager who supervises all the activities of branch, is paid at ₹ 90,000 per month.
- Legal charges, Printing & stationery and advertising expenses are incurred at ₹ 30,000, ₹ 12,000 and ₹ 18,000 respectively for a month.
- Other expenses are ₹ 10,000 per month.

You are required to:

- (a) Compute the cost of processing a Vehicle Loan application on the assumption that 496 Vehicle Loan applications are processed each month.
- (b) Find out the number of Education Loan applications if the total processing cost per Education Loan Application is same as in the Vehicle loan Application as computed in (i) above.

**Solution**

| Particulars                                          | Vehicle Loan Applications (₹)        | Education Loan Applications (₹)      | Total (₹)       |
|------------------------------------------------------|--------------------------------------|--------------------------------------|-----------------|
| Employee Cost                                        | $\frac{50,000 \times 4}{2,00,000} =$ | $\frac{70,000 \times 2}{1,40,000} =$ | 3,40,000        |
| Apportionment of branch manager's salary             | 27,000                               | 27,000                               | 54,000          |
| Legal charges, printing & stationery and advertising | 18,000                               | 18,000                               | 36,000          |
| Other expenses                                       | 3,000                                | 3,000                                | 6,000           |
| <b>Total cost</b>                                    | <b>2,48,000</b>                      | <b>1,88,000</b>                      | <b>4,36,000</b> |

(a) Cost of processing vehicle loan application =  $\frac{\text{Total cost}}{\text{No. of applications}} = \frac{2,48,000}{496} = ₹ 500$

(b) Cost of processing education loan application =  $\frac{\text{Total cost}}{\text{No. of applications}}$

$$500 = \frac{1,88,000}{\text{No. of applications}}$$

$$\text{No. of applications} = \frac{1,88,000}{500} = 376$$

# Service Costing

## MCQs

Q(1). Composite cost unit for a hospital is:

- A. per patient
- ☒ B. per patient-day
- C. per day
- D. per bed

Q(2). Cost of diesel and lubricant is an example of:

- ☒ A. operating cost ✓
- B. fixed charges ✓
- C. semi-variable cost ✓
- D. none of the above

Q(3). Cost units used in power sector is:

- A. Kilo meter (KM)
- ☒ B. Kilowatt-hour (kWh)
- C. Number of electric points
- D. Number of hours

Q(4). Absolute Tonne-km is an example of:

- A. Composite unit in power sector
- ☒ B. Composite unit of transport sector
- C. Composite unit for bus operation
- D. Composite unit for oil and natural gas

Q(5). Depreciation is treated as fixed cost if it is related to:

- A. Activity level
- ☒ C. Efflux of time
- B. Related with machine hours
- D. None of the above

Q(6). Jobs undertaken b IT & ITES organizations are considered as:

- ☒ A. project
- B. batch work
- C. contract
- D. all of the above

Q(7). In toll Road costing, the repetitive costs include:

- ☒ A. Maintenance cost
- B. Annual operating costs
- C. None of the above
- D. Both (a) and (b)

Q(8). BOT approach means:

- ☒ A. Build, operate and Transfer
- B. Buy, Operate and Transfer
- C. Build, operate and Trash
- D. Build, Own and Trash

Q(9). Pre-product development activities in insurance companies, include:

- A. Processing of claim ✗
- ☒ C. Provisions of conditions ✓
- B. Selling of policy ✗
- D. policy application processing

Q(10). Which of the following costing method is not appropriate for costing of educational institutes:

- A. Batch costing
- B. Activity based costing
- C. Absorption costing
- ☒ D. Process costing

# PROCESS COSTING - CONCEPTS

## 1. Process Costing

It is used in case of industries where output is obtained by passing through multiple process i.e. output of one process becomes the input for subsequent process until finished goods are obtained.

## 2. Normal Loss

It is a loss which is unavoidable in nature.

Units of such loss are shown on the credit side of process account at scrap value.

**Draft Normal Loss Account**

| Particulars         | Units | Amount | Particulars                | Units | Amount |
|---------------------|-------|--------|----------------------------|-------|--------|
| To Process I A/c ✓  | -     | -      | By Cash A/c (Process – I)* | -     | -      |
| To Process II A/c ✓ | -     | -      | By Cash A/c (Process – II) | -     | -      |
|                     |       |        | By Abnormal Gain A/c**     | -     | -      |
|                     | -     | -      |                            | -     | -      |

(Total units - Ab. Gain units)

SV

## 3. Abnormal Loss

It is a loss which is avoidable in nature.

Units of such loss are shown on the credit side of process account at NCPU.

**Draft Abnormal Loss Account**

| Particulars       | Units | Amount | Particulars                | Units | Amount |
|-------------------|-------|--------|----------------------------|-------|--------|
| To Process I A/c  | -     | -      | By Cash A/c (Process – I)* | -     | -      |
| To Process II A/c | -     | -      | By Cash A/c (Process – II) | -     | -      |
|                   |       |        | By Costing P&L A/c         | -     | -      |
|                   | -     | -      | (Balancing Figure)         | -     | -      |

normal cost per unit

\* Units will be sold at scrap value only being a damaged unit.

## 4. Abnormal Gain

It is unexpected production during normal conditions.

Units of such gain are shown on the debit side of process account at NCPU.

**Draft Abnormal Gain Account**

| Particulars         | Units | Amount | Particulars      | Units | Amount |
|---------------------|-------|--------|------------------|-------|--------|
| To Normal Loss A/c* | -     | -      | By Process I A/c | -     | -      |
| To Costing P&L A/c  | -     | -      |                  |       |        |

(B/F)

NCPU

|                    |   |   |  |   |   |
|--------------------|---|---|--|---|---|
| (Balancing Figure) |   |   |  |   |   |
|                    | - | - |  | - | - |

\* The abnormal gain units valued at scrap will be shown here since only the actual profit is to be taken to costing P&L account.

## 5. Process Account

### Draft Process Account

| Particulars                          | Units | Amount | Particulars                     | Units | Amount |
|--------------------------------------|-------|--------|---------------------------------|-------|--------|
| To Previous <u>Process A/c</u>       | -     | -      | By Normal <u>Loss A/c</u>       | -     | x      |
| To Material ✓                        | -     | -      | (weight loss)                   |       |        |
| To Labour ✓                          |       | -      | By Normal loss A/c              | -     | - SV   |
| To Factory OHs ✓                     |       | -      | (having scrap value)            |       |        |
| To Toxic Waste A/c (No. loss Cost) → |       | -      | By Normal loss A/c              | -     |        |
| To Abnormal <u>Gain A/c</u>          | -     | - NC   | (requiring cost to be incurred) |       |        |
|                                      |       |        | By Abnormal loss A/c            | -     | - NC   |
|                                      |       |        | By Next <u>Process A/c</u>      | -     | - NC   |
|                                      |       |        | (Tfd.)                          |       |        |
|                                      |       |        | By Costing P&L A/c              | -     | - NC   |
|                                      |       |        | (sold)                          |       |        |
|                                      |       |        | By Finished <u>Goods A/c</u>    | -     | - NC   |

$$\text{Normal cost per unit (NCPU)} = \frac{\text{Total cost} - \text{Scrap value of Normal loss}}{\text{Total units} - \text{Normal loss units}}$$

## 6. Treatment of Royalty

- Debit the amount of royalty on the basis of normal production units
- Excess or less payment of royalty will be adjusted in abnormal loss or gain account
- In Royalty account only final amount on actual units produced will be payable.

## 7. Process Account with raw material stock

- Opening units of raw material stock along with its value will be debited to the process account.
- Closing units of raw material stock along with its value will be credited to the process account.
- Opening and closing stock of raw material should be adjusted while computing normal cost per unit of the process.

Normal cost per unit =

$$\frac{\text{Total Cost (includes op. raw mat.)} - \text{Closing raw mat. cost} - \text{Scrap value of Nr. loss units}}{\text{Total Units (includes op. raw mat.)} - \text{Closing raw mat. units} - \text{Normal loss units}}$$

## 8. Process Account with finished goods stock

- (a) A separate process account is prepared for each process.
- (b) Opening units of finished goods along with its value will be debited to the process stock account.
- (c) Closing units of finished goods stock along with its value will be credited to the process stock account.
- (d) All the goods produced by the process will be transferred to process stock account.

## 9. Process Account with WIP stock

- (a) Opening units of WIP along with its value will be debited to the process account.
- (b) Closing units of WIP along with its value will be credited to the process account.

## 10. Valuation of WIP

- (a) Calculate equivalent units of production for each element of cost i.e. material, labour and overheads by preparing statement of equivalent units. ↗ No. of units
- (b) Calculate cost per equivalent unit for each element of cost i.e. material, labour and overheads. ↗ P.V.
- (c) Calculate the value of WIP by multiplying the equivalent units of WIP along with cost per equivalent unit.

Apply

- A) Ques. Specify to use  
B) DOC of op. WIP is not given

## 11. Methods of WIP Stock Valuation

|                                         | FIFO Method                   | W. Average Method             |
|-----------------------------------------|-------------------------------|-------------------------------|
| <b>Ist Process</b> → No. loss           | Scrap value - deduct          | from Mat. Cost                |
| Opening WIP                             | <u>Bal. DOC</u>               | <u>100%</u>                   |
| Introduced & Complete                   | <u>100%</u>                   | <u>100%</u>                   |
| Normal Loss                             | <u>NIL</u>                    | <u>NIL</u>                    |
| Abnormal Loss                           | <u>DOC / 100%</u>             | <u>DOC / 100%</u>             |
| Closing WIP                             | <u>DOC</u>                    | <u>DOC</u>                    |
|                                         |                               |                               |
| <b>Subsequent Process or</b> → No. loss | Scrap value -                 | Deduct from Mat.-1            |
| <b>Double Material Questions</b>        | Mat.-1, M-2 & OH              | M-1, M-2 & OH                 |
| Opening WIP                             | <u>NIL</u> <u>Bal. DOC</u>    | <u>100%</u> <u>100%</u>       |
| Introduced & Complete                   | <u>100%</u> <u>100%</u>       | <u>100%</u> <u>100%</u>       |
| Normal Loss                             | <u>NIL</u> <u>NIL</u>         | <u>NIL</u> <u>NIL</u>         |
| Abnormal loss                           | <u>100%</u> <u>DOC / 100%</u> | <u>100%</u> <u>DOC / 100%</u> |
| Closing WIP                             | <u>100%</u> <u>DOC</u>        | <u>100%</u> <u>DOC</u>        |

↓  
Under this method, Cost of op. WIP will be added with current cost while calculating cost per Equivalent unit

⊗ In case of Ab. Gain, DOC will always be 100% and will be shown as deduction in St. of Equivalent units.

## 12. Inter Process Profit

Transfer goods from one process to other on cost plus profit basis.

# PROCESS COSTING – QUESTIONS

## Question – 1

SK Ltd. produces a product-X, which passes through three processes, I, II and III. In Process-III a by-product arises, which after further processing at a cost of ₹ 85 per unit, product Z is produced. The information related for the month of April 2021 is as follows:

|                                    | Process-I | Process-II | Process-III |
|------------------------------------|-----------|------------|-------------|
| Normal loss                        | 5%        | 10%        | 5%          |
| Materials introduced (7,000 units) | 1,40,000  | -          | -           |
| Other materials added              | ✓ 62,000  | ✓ 1,36,000 | ✓ 84,200    |
| Direct wages                       | ✓ 42,000  | ✓ 54,000   | ✓ 48,000 =  |
| Direct expenses                    | ✓ 14,000  | ✓ 16,000   | ✓ 14,000    |

Production overhead for the month is ₹ 2,88,000, which is absorbed as a percentage of direct wages.

The scrapes are sold at ₹ 10 per unit

Product-Z can be sold at ₹ 135 per unit with a selling cost of ₹ 15 per unit

No. of units produced:

Process-I- 6,600; Process-II- 5,200, Process-III- 4,800 and Product-Z- 600

There is not stock at the beginning and end of the month.

You are required to PREPARE accounts for:

- Process-I, II and III
- By-product process.

## Solution

### (i) Process- I Account

| Particulars                          | Units | Amount(₹)  | Particulars                              | Units | Amount(₹) |
|--------------------------------------|-------|------------|------------------------------------------|-------|-----------|
| To Material                          | 7,000 | ✓ 1,40,000 | By Normal loss<br>(7,000 × 5% × ₹ 10)    | ✓ 350 | ✓ 3,500   |
| To Other Material                    | --    | ✓ 62,000   | By Abnormal loss A/c<br>(50 × ₹ 50.9022) | → 50  | → 2,545   |
| To Direct Wages                      | --    | ✓ 42,000   | By Process II A/c<br>(6,600 × ₹ 50.9022) | 6,600 | 3,35,955  |
| To Direct Exp.                       | --    | ✓ 14,000   |                                          |       |           |
| To Prod. OHs<br>(200% ×<br>₹ 42,000) | --    | ✓ 84,000   |                                          |       |           |
|                                      | 7,000 | 3,42,000   |                                          | 7,000 | 3,42,000  |

$$\text{Cost per unit} = \frac{3,42,000 - 3,500}{7,000 - 350} = \frac{3,38,500}{6,650} = ₹ 50.9022$$

$$\frac{2,88,000}{144,000} \times 100 = 200\%$$

### Process- II Account

| Particulars                          | Units   | Amount(₹)  | Particulars                                | Units | Amount(₹) |
|--------------------------------------|---------|------------|--------------------------------------------|-------|-----------|
| To Process-I A/c                     | ✓ 6,600 | ✓ 3,35,955 | By Normal loss<br>(6,600 × 10% × ₹ 10)     | ✓ 660 | ✓ 6,600   |
| To Other Material                    | --      | ✓ 1,36,000 | By Abnormal loss A/c<br>(740 × ₹ 108.3089) | → 740 | → 80,149  |
| To Direct Wages                      | --      | ✓ 54,000   | By Process III A/c<br>(5,200 × ₹ 108.3089) | 5,200 | 5,63,206  |
| To Direct Exp.                       | --      | ✓ 16,000   |                                            |       |           |
| To Prod. OHs<br>(200% ×<br>₹ 54,000) | --      | ✓ 1,08,000 |                                            |       |           |
|                                      | 6,600   | 6,49,955   |                                            | 6,600 | 6,49,955  |

$$\text{Cost per unit} = \frac{6,49,955 - 6,600}{6,600 - 660} = \frac{6,43,355}{5,940} = ₹ 108.3089$$

### Process- III Account

| Particulars                          | Units   | Amount(₹)  | Particulars                              | Units | Amount(₹)  |
|--------------------------------------|---------|------------|------------------------------------------|-------|------------|
| To Process-II A/c                    | ✓ 5,200 | ✓ 5,63,206 | By Normal loss<br>(5,200 × 5% × ₹ 10)    | ✓ 260 | ✓ 2,600    |
| To Other Material                    | --      | ✓ 84,200   | By Product X A/c<br>(4,800 × ₹ 180.1396) | 4,800 | → 8,64,870 |
| To Direct Wages                      | --      | ✓ 48,000   | By Product Z A/c<br>[600 × (135-85-15)]  | ✓ 600 | ✓ 21,000   |
| To Direct Exp.                       | --      | ✓ 14,000   |                                          |       |            |
| To Prod. OHs<br>(200% ×<br>₹ 48,000) | --      | ✓ 96,000   |                                          |       |            |
| To Ab. Gain<br>(460 ×<br>₹ 180.1396) |         |            |                                          |       |            |
|                                      | 5,660   | 8,88,270   |                                          | 5,660 | 8,88,270   |

$$\text{Cost per unit} = \frac{8,05,406 - 2,600 - 21,000}{5,200 - 260 - 600} = \frac{7,81,806}{4,340} = ₹ 180.1396$$

(ii)

### By-Product Process Account

| Particulars                   | Units | Amount(₹) | Particulars      | Units | Amount(₹) |
|-------------------------------|-------|-----------|------------------|-------|-----------|
| To Process-III A/c            | → 600 | → 21,000  | By Product Z A/c | 600   | 81,000    |
| To Processing cost [85 × 600] | --    | ✓ 51,000  |                  |       |           |
| To Selling exp. [15 × 600]    | --    | → 9,000   |                  |       |           |

|  |     |        |  |     |        |
|--|-----|--------|--|-----|--------|
|  | 600 | 81,000 |  | 600 | 81,000 |
|--|-----|--------|--|-----|--------|

## Question – 2

A Manufacturing unit manufactures a product 'XYZ' which passes through three distinct Processes – X, Y and Z. The following data is given:

|                          | Process X | Process Y | Process Z |
|--------------------------|-----------|-----------|-----------|
| Material consumed (in ₹) | 2,600     | 2,250     | 2,000     |
| Direct wages (in ₹)      | 4,000     | 3,500     | 3,000     |

- The total production overhead of ₹ 15,750 was recovered @ 150% of direct wages.
- 15,000 units at ₹ 2 each were introduced to process 'X'.
- The output of each process passes to the next process and finally, 12,000 units were transferred to Finished Stock Account from Process 'Z'.
- No stock of materials or work in progress was left at the end.

The following additional information is given:

| Process | % of wastage to normal output | Value of Scrap per unit (₹) |
|---------|-------------------------------|-----------------------------|
| X       | 6%                            | 1.10                        |
| Y       | ?                             | 2.00                        |
| Z       | 5%                            | 1.00                        |

You are required to:

- (i) Find out the percentage of wastage in process 'Y', given that the output of process 'Y' is transferred to Process 'Z' at ₹ 4 per unit.
- (ii) Prepare Process accounts for the three processes X, Y and Z.

## Solution

- (i) Let normal loss units in process Y =  $y$   
 Normal cost per unit of Process Y =  $\frac{\text{Total Cost} - \text{Scrap value of normal loss}}{\text{Total units} - \text{Normal loss unit}}$

$$4 = \frac{52,610 - 2y}{14,100 - y}$$

$$56,400 - 4y = 52,610 - 2y$$

$$2y = 3,790$$

$$y = 1,895$$

$$\text{Thus, Normal loss \% of process Y} = \frac{1,895}{14,100} \times 100 = 13.44\%$$

(ii)

### Process X Account

| Particulars          | Units  | Amount | Particulars          | Units | Amount |
|----------------------|--------|--------|----------------------|-------|--------|
| To Units Introduced  | 15,000 | 30,000 | By Normal loss A/c   | 900   | 990    |
| To Material consumed | -      | 2,600  | (15,000 × 6% × 1.10) |       |        |

|                |        |         |                    |          |        |
|----------------|--------|---------|--------------------|----------|--------|
| To Labour      | -      | ✓ 4,000 | By Process Y A/c   | → 14,100 | 41,610 |
| To Overheads   | -      | ✓ 6,000 | (14,100 × 2.95106) |          |        |
| (4,000 × 150%) | 15,000 | 42,600  |                    | 15,000   | 42,600 |

$$\text{Normal cost per unit} = \frac{42,600 - 990}{15,000 - 900} = \frac{41,610}{14,100} = ₹ 2.95106$$

### Process Y Account

| Particulars          | Units    | Amount  | Particulars        | Units    | Amount   |
|----------------------|----------|---------|--------------------|----------|----------|
| To Process X A/c     | ✓ 14,100 | 41,610  | By Normal loss A/c | 1,895    | → 3,790  |
| To Material consumed | -        | ✓ 2,250 | (Part (i))         |          |          |
| To Labour            | -        | ✓ 3,500 | By Process Z A/c   | → 12,205 | → 48,820 |
| To Overheads         | -        | ✓ 5,250 |                    |          |          |
| (3,500 × 150%)       | 14,100   | 52,610  |                    | 14,100   | 52,610   |

### Process Z Account

| Particulars          | Units    | Amount   | Particulars           | Units  | Amount |
|----------------------|----------|----------|-----------------------|--------|--------|
| To Process Y A/c     | ✓ 12,205 | ✓ 48,820 | By Normal loss A/c    | 610    | 610    |
| To Material consumed | -        | ✓ 2,000  | (12,205 × 5% × 1)     |        |        |
| To Labour            | -        | ✓ 3,000  | By Finished Stock A/c | 12,000 | 59,725 |
| To Overheads         | -        | ✓ 4,500  | (12,000 × 4.97715)    |        |        |
| (3,000 × 150%)       |          |          |                       |        |        |
| To Abnormal Gain A/c | → 405    | 2,015    |                       |        |        |
| (405 × 4.97715)      | 12,610   | 60,335   |                       | 12,610 | 60,335 |

$$\text{Normal cost per unit} = \frac{58,320 - 610}{12,205 - 610} = \frac{57,710}{11,595} = ₹ 4.97715$$

### Question – 3

SK Ltd. processes product Z through two distinct processes – Process I and process II. On completion, it is transferred to finished stock. From the following information for the current year, prepare Process I and Process II and Finished Stock A/c.

| Particulars                             | Process – I   | Process - II |
|-----------------------------------------|---------------|--------------|
| Raw materials used                      | → 7,500 units | -            |
| Raw materials cost per unit             | → ₹ 60        | -            |
| Transfer to next process/finished stock | → 7,050 units | 6,525 units  |
| Normal loss (on inputs)                 | → 5%          | 10%          |
| Direct wages                            | → ₹ 1,35,750  | → ₹ 1,29,250 |

|                                    |   |                     |   |                     |
|------------------------------------|---|---------------------|---|---------------------|
| Direct expenses                    | → | 60% of direct wages | → | 65% of direct wages |
| Manufacturing overheads            | → | 20% of direct wages | → | 15% of direct wages |
| Realisable value of scrap per unit | → | ₹ 12.50 ✓           |   | ₹ 37.50             |

6,000 units of finished goods were sold at a profit of 15% on cost. Assume that there was no opening or closing stock of work-in-process.

### Solution

#### Process I Account

|                       | Qty.    | Amount   |                     | Qty.  | Amount   |
|-----------------------|---------|----------|---------------------|-------|----------|
| To Raw material       | 7,500 ✓ | 4,50,000 | By Normal Loss      | 375 ✓ | 4,688 ✓  |
| To Direct wages       | 0 ✓     | 1,35,750 | (5% × 7,500 × 12.5) |       |          |
| To Direct expenses    |         | 81,450 ✓ | )                   | 75    | 7,259    |
| (60% of direct wages) |         |          | By Abnormal         |       |          |
| To Manufacturing OHs  |         | 27,150 ✓ | Loss                | 7,050 | 6,82,403 |
| (20% of direct wages) |         |          | (75 × 96.7947)      |       |          |
|                       |         |          | By Process II       |       |          |
|                       | 7,500   | 6,94,350 | A/c                 | 7,500 | 6,94,350 |
|                       | 0       |          | (7,050 × 96.7947)   |       |          |

Planned output – Process I =  $7,500 - 375 = 7,125$  units ✓

Actual output = 7,050 units

Abnormal loss = (7,125 units – 7,050 units) 75 units.

Cost per unit =  $\frac{6,94,350 - 4,688}{7,125} = ₹ 96.7947$  ✓

#### Process II Account

|                       | Qty.    | Amount   |                      | Qty.  | Amount   |
|-----------------------|---------|----------|----------------------|-------|----------|
| To Process I          | 7,050 ✓ | 6,82,403 | By Normal loss       | 705 ✓ | 26,438 ✓ |
| To Direct wages       | →       | 1,29,250 | (10%)                |       |          |
| To Direct Expenses    | →       | 84,013   | (7,050 × 10% × 37.5) |       |          |
| (65% of direct wages) |         |          | By Finished Stock    | 6,525 | 9,13,824 |
| To Manufacturing OHs  | →       | 19,387   | A/c                  |       |          |
| To Abnormal gain      | →       | 25,209   | (6,525 × 140.096)    |       |          |
| (180 × 140.096)       | 7,230   | 9,40,262 |                      | 7,230 | 9,40,262 |

Planned output of Process II =  $7,050 - 705 = 6,345$  units ✓

$$\text{Cost per unit} = \frac{9,15,053 - 26,438}{6,345} = ₹ 140.096$$

$$\text{Abnormal gain} = \text{Actual output} - \text{Planned output} = 6,525 - 6,345 = 180 \text{ units}$$

#### Finished Stock Account

|               | Qty.  | Amount   |                      | Qty.  | Amount   |
|---------------|-------|----------|----------------------|-------|----------|
| To Process II | 6,525 | 9,13,824 | By Cost of Sales A/c | 6,000 | 8,40,298 |
|               |       |          |                      | 525   | 73,526   |
|               | 6,525 | 9,13,824 | By Balance c/d       | 6,525 | 9,13,824 |

$$\frac{9,13,824}{6,525} \times 6,000$$

$$\frac{9,13,824}{6,525} \times 525$$

#### Income Statement

|                                              | Amount   |                                               | Amount   |
|----------------------------------------------|----------|-----------------------------------------------|----------|
| To Cost of Sales<br>(6,000 × 140.096)        | 8,40,298 | By Abnormal Gain<br>[180 × (140.0496 - 37.5)] | 18,459   |
| To Abnormal loss<br>[75 × (96.7947 - 12.50)] | 6,322    | By Sales<br>(8,40,298 × 115%)                 | 9,66,343 |
| To Net Profit                                | 1,38,182 |                                               |          |
|                                              | 9,84,802 |                                               | 9,84,802 |

#### Question – 4

Following details are related to the work done in Process-I by ABC Ltd. during the month of May 2019:

(₹)

|                                                 |           |
|-------------------------------------------------|-----------|
| Opening work-in-process (3,000 units)           |           |
| Materials                                       | 1,80,500  |
| Labour                                          | 32,400    |
| Overheads                                       | 90,000    |
| Material introduced in Process-I (42,000 units) | 36,04,000 |
| Labour                                          | 4,50,000  |
| Overheads                                       | 15,18,000 |

$$1,80,500 + 32,400 + 90,000 = 3,02,900$$

$$36,04,000 + 4,50,000 + 15,18,000 = 55,72,000$$

Units scrapped (Total) : → 4,800 units

Degree of completion:

Materials : → 100% ✓

Labour & Overheads : → 70% ✓

Closing work-in-progress : 4,200 units ✓

Degree of completion:

Materials : 100% ✓

Labour & Overheads : 50% ✓

Units finished and transferred to Process-II: 36,000 units

Normal loss:

4% of total input including opening work-in-process

Scrapped units fetch ₹ 62.50 per piece

Prepare:

- (iii) Statement of equivalent production
- (iv) Statement of cost per equivalent unit
- (v) Process-I A/c
- (vi) Normal loss account and
- (vii) Abnormal loss account

### Solution

#### (i) Statement of Equivalent Production

| <u>Input</u>    | <u>Output</u>                            | <u>Material</u> |        | <u>Labour</u> |        | <u>Overheads</u> |        |
|-----------------|------------------------------------------|-----------------|--------|---------------|--------|------------------|--------|
|                 |                                          | %               | Units  | %             | Units  | %                | Units  |
| Op. WIP → 3,000 | Op. WIP → 3,000                          | 100             | 3,000  | 100           | 3,000  | 100              | 3,000  |
| Input → 42,000  | Introduced & Complete (B/F) 33,000       | 100             | 33,000 | 100           | 33,000 | 100              | 33,000 |
|                 | Transferred → 36,000                     |                 |        |               |        |                  |        |
|                 | Normal Loss → 1,800<br>(45,000 × 4%)     | -               | -      | -             | -      | -                | -      |
|                 | Abnormal Loss → 3,000<br>(4,800 - 1,800) | 100             | 3,000  | 70            | 2,100  | 70               | 2,100  |
|                 | Closing WIP → 4,200                      | 100             | 4,200  | 50            | 2,100  | 50               | 2,100  |
| 45,000          | 45,000                                   |                 | 43,200 |               | 40,200 |                  | 40,200 |

#### (ii) Statement of Cost per Equivalent Unit

| <u>Particulars</u>                                | <u>Material</u> | <u>Labour</u> | <u>Overheads</u> |
|---------------------------------------------------|-----------------|---------------|------------------|
| Current Cost → 36,04,000 ✓                        | 4,50,000 ✓      | 15,18,000 ✓   |                  |
| Add: Cost of Opening WIP → 1,80,500               | 32,400          | 90,000        |                  |
| Less: Normal Scrap (1,800 × 62.50) → (1,12,500) ✓ | -               | -             |                  |
| Total → 36,72,000                                 | 4,82,400        | 16,08,000     |                  |
| Equivalent Units → 43,200                         | 40,200          | 40,200        |                  |
| Cost per equivalent unit                          | 85              | 12            | 40               |

#### Statement of apportionment of cost

| <u>Particulars</u> | <u>Element of Cost</u> | <u>Equivalent units</u> | <u>Cost per unit</u> | <u>Cost</u> | <u>Total Cost</u> |
|--------------------|------------------------|-------------------------|----------------------|-------------|-------------------|
| Opening WIP        | Material               | 3,000                   | 85 ✓                 | 2,55,000    |                   |

|                    |           |        |    |           |           |
|--------------------|-----------|--------|----|-----------|-----------|
|                    | Labour    | 3,000  | 12 | 36,000    |           |
|                    | Overheads | 3,000  | 40 | 1,20,000  | 4,11,000  |
| Introduced & Comp. | Material  | 33,000 | 85 | 28,05,000 |           |
|                    | Labour    | 33,000 | 12 | 3,96,000  |           |
|                    | Overheads | 33,000 | 40 | 13,20,000 | 45,21,000 |
| Abnormal Loss      | Material  | 3,000  | 85 | 2,55,000  |           |
|                    | Labour    | 2,100  | 12 | 25,200    |           |
|                    | Overheads | 2,100  | 40 | 84,000    | 3,64,200  |
| Closing WIP        | Material  | 4,200  | 85 | 3,57,000  |           |
|                    | Labour    | 2,100  | 12 | 25,200    |           |
|                    | Overheads | 2,100  | 40 | 84,000    | 4,66,200  |

(iii)

### Process I Account

| Particulars    | Units  | Amount    | Particulars                   | Units  | Amount    |
|----------------|--------|-----------|-------------------------------|--------|-----------|
| To Opening WIP | 3,000  | 3,02,900  | By Normal loss A/c            | 1,800  | 1,12,500  |
| To Material    | 42,000 | 36,04,000 | By Abnormal loss A/c          | 3,000  | 3,64,200  |
| To Labour      | -      | 4,50,000  | By Process -II A/c (bal. fig) | 36,000 | 49,32,000 |
| To Overheads   | -      | 15,18,000 | By Closing WIP                | 4,200  | 4,66,200  |
|                | 45,000 | 58,74,900 |                               | 45,000 | 58,74,900 |

(iv)

### Normal Loss Account

| Particulars      | Units | Amount   | Particulars | Units | Amount   |
|------------------|-------|----------|-------------|-------|----------|
| To Process-I A/c | 1,800 | 1,12,500 | By Bank A/c | 1,800 | 1,12,500 |
|                  | 1,800 | 1,12,500 |             | 1,800 | 1,12,500 |

(v)

### Abnormal Loss Account

| Particulars      | Units | Amount   | Particulars        | Units | Amount   |
|------------------|-------|----------|--------------------|-------|----------|
| To Process-I A/c | 3,000 | 3,64,200 | By Bank A/c        | 3,000 | 1,87,500 |
|                  |       |          | (3,000 × 62.50)    |       |          |
|                  |       |          | By Costing P&L A/c |       | 1,76,700 |
|                  |       |          | (Bal. fig.)        |       |          |
|                  | 3,000 | 3,64,200 |                    | 3,000 | 3,64,200 |

### Question – 5

From the following data related to Process X, prepare process X account:

(a) Opening work in progress: 800 units valued as under:

Material = ₹ 3,200

Labour = ₹ 960

Overhead = ₹ 320

(b) Input of material = 9200 units

(c) Current cost: Material = ₹ 36,800 ✓

Labour = ₹ 16,740 ✓

Overhead = ₹ 7,930 ✓

(d) Normal loss = 8% of total input

(e) Scrap realized ₹ 40 per 10 units

(f) Closing work in progress = 900 units

(g) Transfer to next process = 7,900 units

(h) Degree of completion:

|          | <u>Closing Stock</u> | <u>Scrap</u> |
|----------|----------------------|--------------|
| Material | 100%                 | 100%         |
| Labour   | 70%                  | 80%          |
| Overhead | 30%                  | 20%          |

### Solution

#### Statement of Equivalent Production

| Input       | Output                           | Material |       | Labour |       | Overheads |       |
|-------------|----------------------------------|----------|-------|--------|-------|-----------|-------|
|             |                                  | %        | Units | %      | Units | %         | Units |
| Op. WIP 800 | Op. WIP 800                      | 100      | 800   | 100    | 800   | 100       | 800   |
| Input 9,200 | Introduced & Complete 7,100      | 100      | 7,100 | 100    | 7,100 | 100       | 7,100 |
|             | Transferred 7,900                |          |       |        |       |           |       |
|             | Normal Loss 800<br>(10,000×8%)   | -        | -     | -      | -     | -         | -     |
|             | Abnormal Loss 400<br>(Bal. Fig.) | 100      | 400   | 80     | 320   | 20        | 80    |
|             | Closing WIP 900                  | 100      | 900   | 70     | 630   | 30        | 270   |
| 10,000      | 10,000                           |          | 9,200 |        | 8,850 |           | 8,250 |

#### Statement of Cost per Equivalent Unit

| Particulars              | Material | Labour | Overheads |
|--------------------------|----------|--------|-----------|
| Cost                     | 36,800   | 16,740 | 7,930     |
| Add: Cost of Opening WIP | 3,200    | 960    | 320       |
| Less: Normal Scrap       | (3,200)  | -      | -         |
| Total                    | 36,800   | 17,700 | 8,250     |
| Equivalent Units         | 9,200    | 8,850  | 8,250     |

|                          |   |   |   |
|--------------------------|---|---|---|
| Cost per equivalent unit | 4 | 2 | 1 |
|--------------------------|---|---|---|

**Statement of apportionment of cost**

| Particulars           | Element of Cost | Equivalent units | Cost per unit | Cost   | Total Cost |
|-----------------------|-----------------|------------------|---------------|--------|------------|
| Opening WIP           | Material        | 800              | 4             | 3,200  | 5,600      |
|                       | Labour          | 800              | 2             | 1,600  |            |
|                       | Overheads       | 800              | 1             | 800    |            |
| Introduced & Complete | Material        | 7,100            | 4             | 28,400 | 49,700     |
|                       | Labour          | 7,100            | 2             | 14,200 |            |
|                       | Overheads       | 7,100            | 1             | 7,100  |            |
| Abnormal Loss         | Material        | 400              | 4             | 1,600  | 2,320      |
|                       | Labour          | 320              | 2             | 640    |            |
|                       | Overheads       | 80               | 1             | 80     |            |
| Closing WIP           | Material        | 900              | 4             | 3,600  | 5,130      |
|                       | Labour          | 630              | 2             | 1,260  |            |
|                       | Overheads       | 270              | 1             | 270    |            |

**Process X Account**

| Particulars    | Units  | Amount | Particulars                    | Units  | Amount |
|----------------|--------|--------|--------------------------------|--------|--------|
| To Opening WIP | 800    | 4,480  | By Normal loss A/c             | 800    | 3,200  |
| To Material    | 9,200  | 36,800 | By Abnormal loss A/c           | 400    | 2,320  |
| To Labour      | -      | 16,740 | By Next Process A/c (bal. fig) | 7,900  | 55,300 |
| To Overheads   | -      | 7,930  | By Closing WIP                 | 900    | 5,130  |
|                | 10,000 | 65,950 |                                | 10,000 | 65,950 |

**Question – 6**

A company produces a component, which passes through two processes. During the month of April, materials for 40,000 components were put into Process I of which 30,000 were completed and transferred to Process II. Those not transferred to Process II were 100% complete as to materials cost and 50% complete as to labour and overheads cost. The Process I cost incurred were as follows:

|                   |              |
|-------------------|--------------|
| Direct Materials  | → ₹ 15,000 ✓ |
| Direct Wages      | → ₹ 18,000 ✓ |
| Factory Overheads | → ₹ 12,000 ✓ |

Of those transferred to Process II, 28,000 units were completed and transferred to finished goods stores. There was a normal loss with no salvage value of 200 units in Process II. There were 1,800 units, remained unfinished in the process with 100% complete as to materials and 25% complete as regard to wages and overheads.



No further process material costs occur after introduction at the first process until the end of the second process, when protective packing is applied to the completed components. The process and packing costs incurred at the end of the Process II were:

|                    |             |
|--------------------|-------------|
| ✓ Packing Material | → ₹ 4,000 ✓ |
| Direct Wages       | → ₹ 3,500 ✓ |
| Factory Overheads  | → ₹ 4,500 ✓ |

Required:

- Prepare statement of equivalent production, cost per unit and Process I A/c.
- Prepare statement of equivalent production, cost per unit and Process II A/c.

**Solution**

### Statement of Equivalent Production and Cost per Unit for Process I

| Input          | Output                | Material |          | Labour |          | Overheads |          |
|----------------|-----------------------|----------|----------|--------|----------|-----------|----------|
|                |                       | %        | Units    | %      | Units    | %         | Units    |
| Input ✓ 40,000 | Introduced & ✓ 30,000 | 100      | 30,000   | 100    | 30,000   | 100       | 30,000   |
|                | Closing WIP ✓ 10,000  | 100      | 10,000 ✓ | 50     | 5,000 ✓  | 50        | 5,000    |
| 40,000         | 40,000                | →        | 40,000 ✓ | →      | 35,000   | →         | 35,000   |
|                | Cost                  |          | 15,000 ✓ |        | 18,000   |           | 12,000   |
|                | Cost per unit         | →        | 0.375    |        | 0.514286 |           | 0.342857 |

### Statement of apportionment of cost for Process I

| Particulars           | Element of Cost | Equivalent units | Cost per unit | Cost   | Total Cost |
|-----------------------|-----------------|------------------|---------------|--------|------------|
| Introduced & Complete | Material        | 30,000 ✓         | 0.375         | 11,250 | 36,965 ✓   |
|                       | Labour          | 30,000 ✓         | 0.514286      | 15,429 |            |
|                       | Overheads       | 30,000 ✓         | 0.342857      | 10,286 |            |
| Closing WIP           | Material        | 10,000 ✓         | 0.375         | 3,750  | 8,035 ✓    |
|                       | Labour          | 5,000 ✓          | 0.514286      | 2,571  |            |
|                       | Overheads       | 5,000 ✓          | 0.342857      | 1,714  |            |

### Process I Account

| Particulars  | Units    | Amount   | Particulars         | Units    | Amount   |
|--------------|----------|----------|---------------------|----------|----------|
| To Material  | 40,000 ✓ | 15,000 ✓ | By Process II A/c ✓ | 30,000   | 36,965 ✓ |
| To Labour    | -        | 18,000 ✓ | By Closing WIP      | 10,000 ✓ | 8,035 ✓  |
| To Overheads | -        | 12,000 ✓ |                     |          |          |
|              | 40,000   | 45,000   |                     | 40,000   | 45,000   |

✓ Revd. from P. I ✓ Packing Mat.  
**Statement of Equivalent Production and cost per unit for Process II**

| Input        | Output                         | Material - 1 |        | Material - 2 |        | Labour |        | Overheads |        |
|--------------|--------------------------------|--------------|--------|--------------|--------|--------|--------|-----------|--------|
|              |                                | %            | Units  | %            | Units  | %      | Units  | %         | Units  |
| Input 30,000 | Introduced & Complete ✓ 28,000 | 100          | 28,000 | 100          | 28,000 | 100    | 28,000 | 100       | 28,000 |
|              | Normal Loss → 200              | -            | -      | -            | -      | -      | -      | -         | -      |
|              | Closing WIP → 1,800            | 100          | 1,800  | -            | -      | 25     | 450    | 25        | 450    |
| 30,000       | 30,000                         | →            | 29,800 | →            | 28,000 | →      | 28,450 | →         | 28,450 |
|              | Cost →                         |              | 36,965 |              | 4,000  |        | 3,500  |           | 4,500  |
|              | Cost per unit →                |              | 1.2404 |              | 0.1429 |        | 0.123  |           | 0.1582 |

**Statement of apportionment of cost for Process II**

| Particulars           | Element of Cost | Equivalent units | Cost per unit | Cost   | Total Cost |
|-----------------------|-----------------|------------------|---------------|--------|------------|
| Introduced & Complete | Material – 1    | 28,000           | 1.2404        | 34,732 | 46,606     |
|                       | Material – 2    | 28,000           | 0.1429        | 4,000  |            |
|                       | Labour          | 28,000           | 0.123         | 3,445  |            |
|                       | Overheads       | 28,000           | 0.1582        | 4,429  |            |
| Closing WIP           | Material – 1    | 1,800            | 1.2404        | 2,233  | 2,359      |
|                       | Material – 2    | -                | 0.1429        | -      |            |
|                       | Labour          | 450              | 0.123         | 55     |            |
|                       | Overheads       | 450              | 0.1582        | 71     |            |

**Process II Account**

| Particulars         | Units  | Amount   | Particulars             | Units  | Amount |
|---------------------|--------|----------|-------------------------|--------|--------|
| To Process I A/c →  | 30,000 | → 36,965 | By Normal loss A/c      | 200    | -      |
| To Packing Material | -      | 4,000    | By Finished Goods A/c → | 28,000 | 46,606 |
| To Labour           | -      | 3,500    | By Closing WIP →        | 1,800  | 2,359  |
| To Overheads        | -      | 4,500    |                         |        |        |
|                     | 30,000 | 48,965   |                         | 30,000 | 48,965 |

**Question – 7**

SK Ltd. manufactures chemical solutions for the food processing industry. The manufacturing takes place in a number of processes and the company uses a FIFO process costing system to value work-in-process and finished goods. At the end of the last month, a fire occurred in the factory and destroyed some of the paper files containing records of the process operations for the month.

SK Ltd. needs your help to prepare the process accounts for the month during which the fire occurred. You have been able to gather some information about the month's operating activities but some of the information could not be retrieved due to the damage. The following information was salvaged:

- Opening work-in-process at the beginning of the month was 800 litres, 70% complete for labour and 60% complete for overheads. Opening work-in-process was valued at ₹ 26,640.
- Closing work-in-process at the end of the month was 160 litres, 30% complete for labour and 20% complete for overheads.
- Normal loss is 10% of input and total losses during the month were 1,800 litres partly due to the fire damage.
- Output sent to finished goods warehouse was 4,200 litres.
- Losses have a scrap value of ₹ 15 per litre.
- All raw materials are added at the commencement of the process.
- The cost per equivalent unit (litre) is ₹ 39 for the month made up as follows:

|              | (₹)  |
|--------------|------|
| Raw Material | 23 ✓ |
| Labour       | 7 ✓  |
| Overheads    | 9 ✓  |
|              | 39   |

Required:

- (a) Calculate the quantity (in litres) of raw material inputs during the month.
- (b) Calculate the quantity (in litres) of normal loss expected from the process and the quantity (in litres) of abnormal loss/gain experienced in the month.
- (c) Calculate the values of raw material, labour and overheads added to the process during the month.
- (d) Prepare the process account for the month.

**Solution**

(a) Calculation of Raw Material inputs during the month:

| Quantities Entering Process    | Litres | Quantities Entering Process | Litres |
|--------------------------------|--------|-----------------------------|--------|
| Opening WIP (Given)            | 800    | Transfer to Finished Goods  | 4,200  |
| Raw material input (bal. fig.) | 5,360  | Process Losses (N.L. + Ab.) | 1,800  |
|                                |        | Closing WIP                 | 160    |
|                                | 6,160  |                             | 6,160  |

(b) Calculation of Normal Loss and Abnormal Loss/Gain

| Particulars                          | Litres  |
|--------------------------------------|---------|
| Total process losses for month       | → 1,800 |
| Normal Loss (10% input) [5360 x 10%] | → 536   |
| Abnormal Loss (balancing figure)     | 1,264   |

(c) Calculation of values of Raw Material, Labour and Overheads added to the process:

| Particulars                                       | Material   | Labour   | Overheads |
|---------------------------------------------------|------------|----------|-----------|
| Cost per equivalent unit                          | ₹ 23.00    | ₹ 7.00   | ₹ 9.00    |
| Equivalent units (litre) (refer the working note) | 4,824      | 4,952    | 5,016     |
| Cost of equivalent units                          | ₹ 1,10,952 | ₹ 34,664 | ₹ 45,144  |
| Add Scrap value of normal loss (536 units × ₹ 15) | ₹ 8,040    | —        | —         |
| Total value added                                 | ₹ 1,18,992 | ₹ 34,664 | ₹ 45,144  |

Workings:

Statement of Equivalent Units (litre):

| Input Details    | Units | Output details  | Units | Equivalent Production |     |        |     |           |     |
|------------------|-------|-----------------|-------|-----------------------|-----|--------|-----|-----------|-----|
|                  |       |                 |       | Material              |     | Labour |     | Overheads |     |
|                  |       |                 |       | Units                 | (%) | Units  | (%) | Units     | (%) |
| Opening WIP      | 800   | Units completed |       |                       |     |        |     |           |     |
| Units introduced | 5,360 | - Opening WIP   | 800   | —                     | —   | 240    | 30  | 320       | 40  |
|                  |       | - Fresh inputs  | 3,400 | 3,400                 | 100 | 3,400  | 100 | 3,400     | 100 |
|                  |       | Normal loss     | 536   | —                     | —   | —      | —   | —         | —   |
|                  |       | Abnormal loss   | 1,264 | 1,264                 | 100 | 1,264  | 100 | 1,264     | 100 |
|                  |       | Closing WIP     | 160   | 160                   | 100 | 48     | 30  | 32        | 20  |
|                  | 6,160 |                 | 6,160 | 4,824                 |     | 4,952  |     | 5,016     |     |

(d) Process account for month

| Particulars      | Litres | Amount (₹) | Particulars       | Litres | Amount (₹) |
|------------------|--------|------------|-------------------|--------|------------|
| To Opening WIP   | 800    | 26,640     | By Finished goods | 4,200  | 1,63,800   |
| To Raw Materials | 5,360  | 1,18,992   | By Normal Loss    | 536    | 8,040      |
| To Wages         | —      | 34,664     | By Abnormal loss  | 1,264  | 49,296     |
| To Overheads     | —      | 45,144     | By Closing WIP    | 160    | 4,304      |
|                  | 6,160  | 2,25,440   |                   | 6,160  | 2,25,440   |

**Question – 8**

KT Ltd. produces a product EMM which passes through two processes before it is completed and transferred to finished stock. The following data relate to May 2019.

| Particulars       | Process A | Process B | Finished Stock |
|-------------------|-----------|-----------|----------------|
| Opening stock     | ₹ 5,000   | ₹ 5,500   | ₹ 10,000       |
| Direct materials  | 9,000     | 9,500     |                |
| Direct wages      | 5,000     | 6,000     |                |
| Factory overheads | 4,600     | 2,030     |                |
| Closing stock     | 2,000     | 2,490     | 5,000          |

Inter process profit included in opening stock --

1,000

4,000

Output of Process A is transferred to Process B at 25% profit on the transfer price and output of Process B is transferred to finished stock at 20% profit on the transfer price. Stock in process is valued at prime cost. Finished stock is valued at the price at which it is received from Process B. Sales during the period are ₹ 75,000.

Prepare the process cost accounts and Finished stock account showing the profit element at each stage.

### Solution

#### Process A Account

| Particulars        | Cost    | Profit | Total   | Particulars      | Cost   | Profit | Total  |
|--------------------|---------|--------|---------|------------------|--------|--------|--------|
| To Opening stock   | 5,000   | -      | 5,000   | By Process B A/c | 28,800 | 7,200  | 21,600 |
| To Direct material | 9,000   | -      | 9,000   |                  |        |        |        |
| To Direct wages    | 5,000   | -      | 5,000   |                  |        |        |        |
| (PC) 19,000        |         | -      | 19,000  |                  |        |        |        |
| (-) Closing stock  | (2,000) | -      | (2,000) |                  |        |        |        |
| 17,000             |         | -      | 17,000  |                  |        |        |        |
| To Factory OHs     | 4,600   | -      | 4,600   |                  |        |        |        |
| 21,600             |         | -      | 21,600  |                  |        |        |        |
| To Profit          | -       | 7,200  | 7,200   |                  |        |        |        |
| 21,600             | 7,200   |        | 28,800  |                  | 21,600 | 7,200  | 28,800 |

#### Process B Account

| Particulars        | Cost    | Profit | Total   | Particulars     | Cost   | Profit | Total  |
|--------------------|---------|--------|---------|-----------------|--------|--------|--------|
| To Opening stock   | 4,500   | 1,000  | 5,500   | By F. Stock A/c | 41,550 | 20,125 | 61,675 |
| To Process A A/c   | 21,600  | 7,200  | 28,800  |                 |        |        |        |
| To Direct material | 9,500   | -      | 9,500   |                 |        |        |        |
| To Direct wages    | 6,000   | -      | 6,000   |                 |        |        |        |
| (PC) 41,600        |         | 8,200  | 49,800  |                 |        |        |        |
| (-) Closing stock  | (2,080) | (410)  | (2,490) |                 |        |        |        |
| 39,520             |         | 7,790  | 47,310  |                 |        |        |        |
| To Factory OHs     | 2,030   | -      | 2,030   |                 |        |        |        |
| 41,550             |         | 7,790  | 49,340  |                 |        |        |        |
| To Profit          | -       | 12,335 | 12,335  |                 |        |        |        |
| 41,550             | 20,125  |        | 61,675  |                 | 41,550 | 20,125 | 61,675 |

Profit element in closing stock =  $\frac{8,200}{49,800} \times 2,490 = ₹ 410$

### Finished Stock Account

| Particulars               | Cost      | Profit    | Total                  | Particulars        | Cost   | Profit | Total  |
|---------------------------|-----------|-----------|------------------------|--------------------|--------|--------|--------|
| To Opening stock → 6,000  | ✓ 6,000   | ✓ 4,000   | ✓ 10,000               | By Costing P&L A/c | 44,233 | 30,767 | 75,000 |
| To Process B A/c → 41,550 | ✓ 41,550  | ✓ 20,125  | ✓ 61,675               |                    |        |        | Given  |
| (Pe) 47,550               | ✓ 47,550  | ✓ 24,125  | ✓ 71,675               |                    |        |        |        |
| (-) Closing stock (3,317) | ✓ (3,317) | ✓ (1,683) | ✓ (5,000)              |                    |        |        |        |
|                           | 44,233    | 22,442    | 66,675 ✓               |                    |        |        |        |
| To Profit (Bal. fig)      | -         | 8,325     | 8,325 → Bal. fig.      |                    |        |        |        |
|                           | 44,233    | 30,767    | 75,000 → Given in Que. |                    | 44,233 | 30,767 | 75,000 |

Profit element in closing stock =  $\frac{24,125}{71,675} \times 5,000 = ₹ 1,683$

# Process Costing

## MCQs

Q(1). The type of process loss that should not be allowed to affect the cost of good unit is:

- ☒ A. Abnormal loss
- B. Normal loss
- C. Seasonal loss
- D. Standard loss

$$N\& \text{ O/P} = 200 - 20 = 180$$

Q(2). 200 units were introduced in a process in which 20 units is the normal loss. If the actual output is 150 units, then there is:

- ☒ A. No abnormal loss
- B. No abnormal gain
- C. Abnormal loss of 30 units
- D. Abnormal gain of 30 units

Q(3). 100 units are processed at a total cost of ₹ 160, normal loss is 10%, & scrap units are sold @ ₹ 0.25 each. If the output is 80 units, then the value of abnormal loss is:

- ☒ A. ₹ 2.50
- B. ₹ 16
- C. ₹ 17.50
- D. ₹ 17.75

$$N\& P.V. = 160 - (10 \times 0.25) = 1.75$$
$$100 - (100 \times 10\%) = 90$$
$$Ab. \text{ loss} = (90 - 80) \times 1.75 = 17.50$$

Q(4). When average method is used in process costing, the opening inventory costs are:

- A. Subtracted from the new costs
- ☒ B. Added to the new costs
- C. Kept separate from the costs of the new period
- D. Averaged with other costs to arrive at total cost

Q(5). Spoilage that occurs under inefficient operating conditions and is ordinarily controllable is called:

- A. Normal spoilage
- ☒ B. Abnormal spoilage
- C. Normal defectives
- D. None of the above

Q(6). The cost of normal process loss is:

- A. Absorbed by good units produced and amount realised by the sale of loss units should be debited to the process account
- B. Debited to costing profit and loss account
- ☒ C. Absorbed by good units produced
- D. Debited to costing profit and loss account and amount realized by the sale of loss units should be credited to the process account.

Q(7). The value of abnormal loss is equal to:

- A. total cost of materials
- B. Total process cost less realizable value of normal loss
- C. Total process cost less cost of scrap
- ☒ D. Total process cost less realizable value of normal loss less value of transferred out goods.

Q(8). Inter-process profit is calculated, because:

- A. a process is a cost centre
- B. each process has to report profit
- ☒ C. the efficiency of the process is measured
- D. the wages of employees are linked to the process profitability

Q(9). Under Weighted Average (Average) Method:

- A. The cost to complete the opening WIP is ignored
- B. The cost to complete the opening WIP and other completed units are calculated separately
- ☒ C. The cost of opening work-in-progress and cost of the current period are aggregated and the aggregate cost is divided by output in terms of complete units.
- D. Closing stock of work in process is valued at current cost.

Q(10). A process account is debited by abnormal gain, the value is determined as:

- A. equal to the value of normal loss
- ☒ B. cost of good units less realizable value of normal loss
- C. cost of good units less realizable value of actual loss
- D. Equal to the value of good units less closing stock

Q(11). Lean Labs develops 55mm film using a four step process that moves progressively through four departments. The company specialized in overnight service and has the largest drug store chain as its primary customer. Currently, direct labour, direct materials, and overhead are accumulated by departments. The cost accumulation system that best describes the system Lean Labs is using is:

- A. Operation costing  
B. Activity based costing  
C. Job-order costing  
☒ D. Process costing

Q(12). When compared with normal spoilage, abnormal spoilage:

- A. Arises more frequently from factors that are inherent in the manufacturing process  
B. Is given the same accounting treatment as normal spoilage  
C. Is generally thought to be more controllable by purchase department than production department  
☒ D. Is not typically by the "tightness" of production standards

Q(13). Assume 550 units were worked on during a period in which a total of 500 good units were completed. Normal spoilage consisted of 30 units; abnormal spoilage, 20 units. Total production costs were ₹ 2,200. The company accounts for abnormal spoilage separately on the income statement as loss due to abnormal spoilage. Normal spoilage is not accounted for separately. What is the cost of the good units produced?

- A. ₹ 2,080  
B. ₹ 2,115  
C. ₹ 2,200  
D. ₹ 2,332

$$NC P.V. = \frac{2200 - 0}{550 - 30} = 4.230769$$

$$Good\ units = 4.230769 \times 500 = 2115.38$$

Q(14). IC Limited uses process costing systems and inspects its goods post manufacturing. An engineer noticed on May 31<sup>st</sup> the following:

|                           |   |        |
|---------------------------|---|--------|
| Good units completed      | → | 15,000 |
| Normal spoilage (units)   | → | 300    |
| Abnormal spoilage (units) | → | 100    |

Unit costs were; Material ₹ 2.50 and conversion costs (labour & overheads) ₹ 6.00. The number of units that company would transfer to its finished goods stock and the related cost of these units are:

- A. 15,000 units transferred to a cost of ₹ 1,27,500  
☒ B. 15,000 units transferred at a cost of ₹ 1,30,050  
C. 15,000 units transferred at a cost of ₹ 1,35,000  
D. 15,300 units transferred at a cost of ₹ 1,30,050

$$Total\ IP = 15000 + 300 + 100 = 15400$$

$$Mat. = 15400 \times 2.50 = 38500$$

$$CC = 6 \times 15400 = 92400$$

$$TC = 130900$$

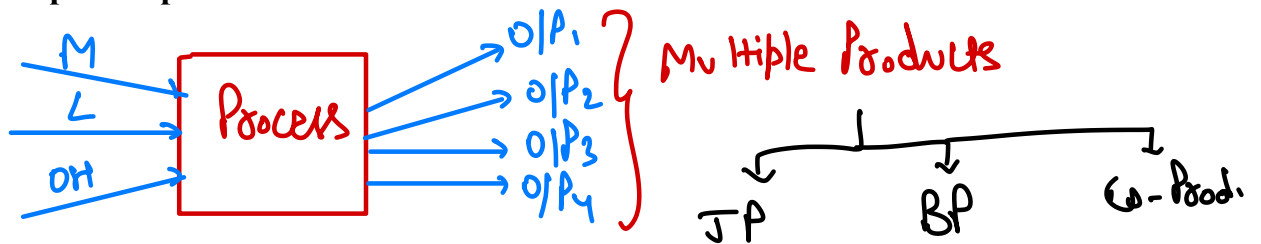
$$NC P.V. = \frac{130900 - 0}{15400 - 300} = 8.66887$$

$$Good\ units = 8.66887 \times 15000$$

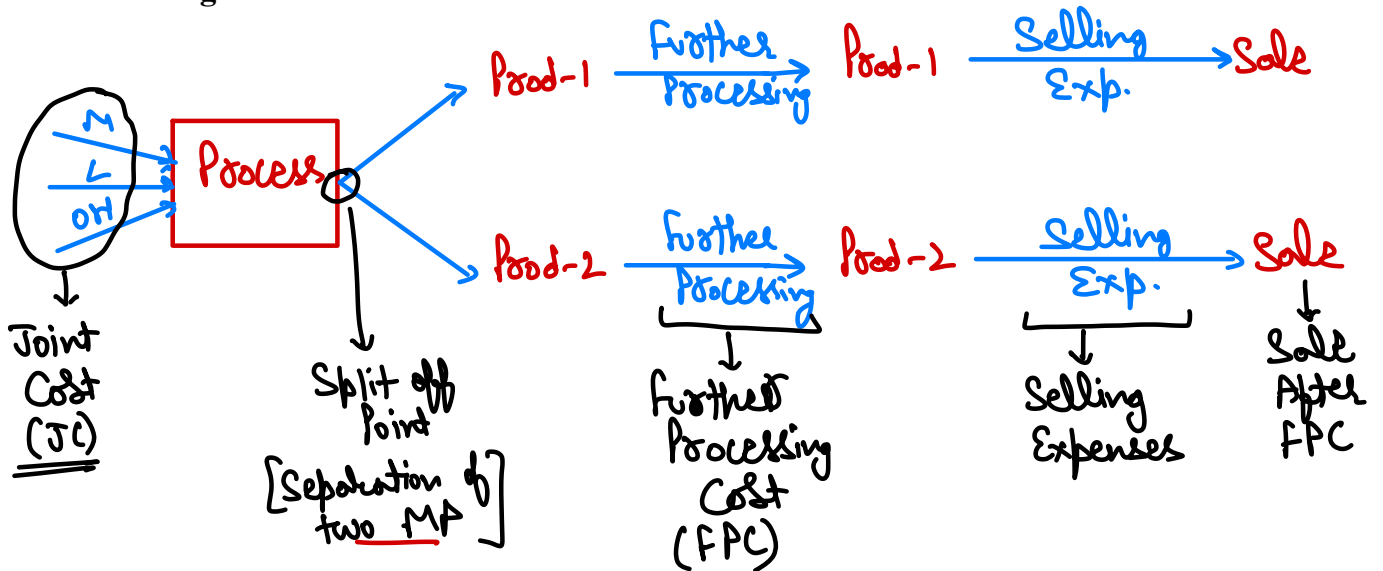
$$Cost = ₹. 130032$$

# JOINT & BY-PRODUCT - CONCEPTS

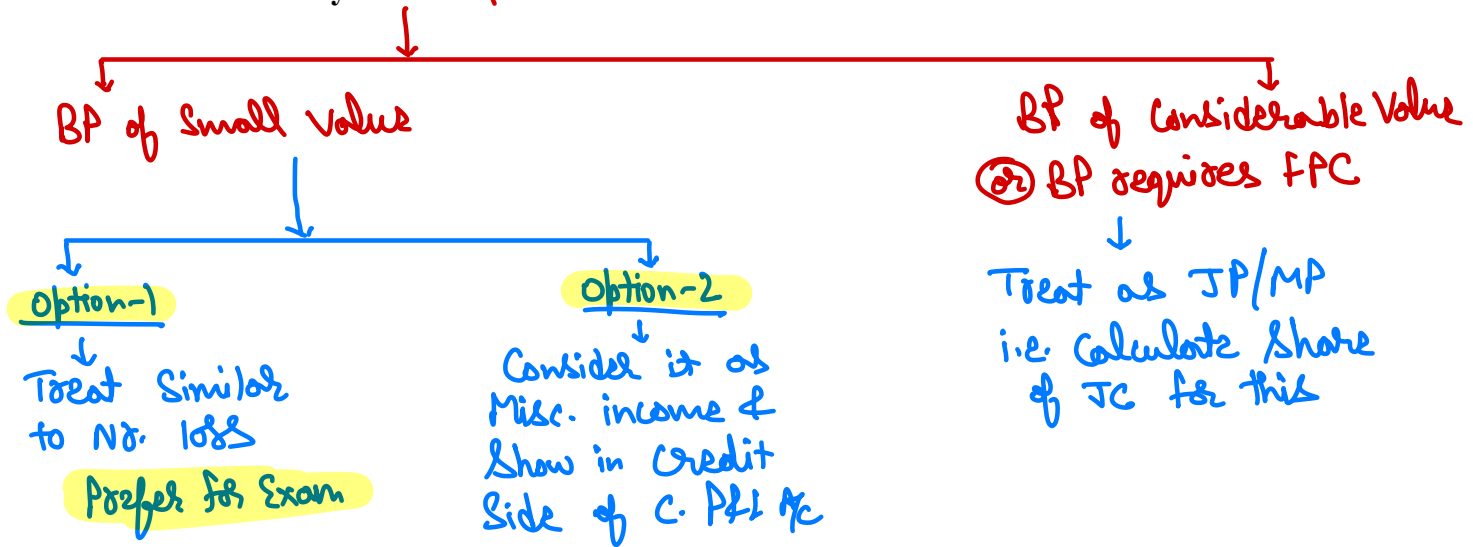
## 1. Multiple Output



## 2. Meaning of Basic Terms



### 3. Treatment of By-Product (BP)



#### 4. Methods of Apportionment of Joint Cost (JC)

##### (A) Reverse Cost Method

| Particulars                     | Product A | Product B |
|---------------------------------|-----------|-----------|
| → Sale value                    | -         | -         |
| → Less: Profit                  | -         | -         |
| Total Cost ✓                    | -         | -         |
| Less: Selling expenses          | -         | -         |
| Work Cost ✓                     | -         | -         |
| Less: Further Processing cost ✓ | -         | -         |
| Share of Joint Cost ✓           | -         | -         |

⊗ If total joint cost is not matching with value given in question then distribute actual joint cost given in question in the share of joint cost calculated from above statement.

⊗ If data of profit is given for only one product then prepare above table for one product after that share of JC of other product = Total JC – Share of JC from above table for one product.

(B) Physical Unit Method – Distribute on the basis of physical units produced

(C) Sale value at split off method – Distribute on the basis of sale value at split off of units produced.

(D) Sale value after FPC method – Distribute on the basis of sale value after FPC of units produced.

(E) Net Realizable Value (NRV) Method – Distribute on the basis of NRV

$$\text{NRV} = \text{Sale after FPC} - \text{Selling Expenses} - \text{FPC}$$

(F) Contribution Margin Method

Distribute variable cost on the basis of units produced

Distributed fixed cost on the basis of contribution

$$\text{Cont.} = \text{Sales} - \text{VC}$$

⊗ If any product has zero or negative contribution than FC will not be distributed for that product.

## 5. Decision Regarding Further Processing

Compare Incremental Revenue with Incremental Cost

If Incremental revenue > Incremental cost → *yes further process*

If Incremental revenue < Incremental cost → *Not to further process*

Incremental revenue = Sale after FPC – Sale at split off

Incremental cost = FPC + Increase in any other cost – Decrease in any other cost

## JOINT & BY-PRODUCT – QUESTIONS

### Question – 1

A Factory is engaged in the production of chemical Bomex and in the course of its manufacture a by-product Cromex is produced which after further processing has a commercial value. For the month of April 2019 the following are the summarized cost data:

|                           | <u>Joint Expenses</u> | <u>Separate Expenses</u> |                   |
|---------------------------|-----------------------|--------------------------|-------------------|
|                           | ₹                     | <u>Bomex (₹)</u>         | <u>Cromex (₹)</u> |
| Materials                 | 1,00,000              | 6,000                    | 4,000             |
| Labour                    | 50,000                | 20,000                   | 18,000            |
| Overheads                 | 30,000                | 10,000                   | 6,000             |
| Selling price per unit    |                       | → 100                    | → 40              |
| Estimated profit per unit |                       | ✗                        | 5                 |
|                           |                       | <u>Units</u>             | <u>Units</u>      |
| No. of units produced     |                       | → 2,000                  | 2,000             |

The factory uses net realizable value method for apportionment of joint cost to by-products. You are required to prepare statements showing:

- (i) the joint cost allocable to Cromex
- (ii) the product-wise and overall profitability of the factory for April 2019.

### Solution

#### (i) Statement showing Joint Cost Allocation to 'Cromex'

| Particulars                                         | Cromex (₹)    |
|-----------------------------------------------------|---------------|
| Sales (₹ 40 × 2,000 units)                          | ✓ 80,000      |
| Less: Post split off costs (4,000 + 18,000 + 6,000) | ✓ (28,000)    |
| Less: Estimated profit (₹ 5 × 2,000)                | ✓ (10,000)    |
| <b>Joint Cost Allocable</b>                         | <b>42,000</b> |

1.80l  
Cromex = 42,000  
Bomex = 1.38l

#### (ii) Statement showing product wise and Overall Profitability

| Particulars                   | Bomex (₹)     | Cromex (₹)    | Total (₹)     |
|-------------------------------|---------------|---------------|---------------|
| Sales                         | → 2,00,000    | → 80,000      | 2,80,000      |
| Less: Share in Joint Expenses | → (1,38,000)* | → (42,000)    | (1,80,000)    |
| Less: Post split off costs    | → (36,000)    | → (28,000)    | (64,000)      |
| <b>Profit</b>                 | <b>26,000</b> | <b>10,000</b> | <b>36,000</b> |

\*This is a balancing figure i.e. 1,80,000 – 42,000 = 1,38,000

## Question – 2

A factory producing article P also produces a by-product Q which is further processed into finished product. The joint costs of manufacture are given below:

|           | ₹               |
|-----------|-----------------|
| Material  | 5,000           |
| Labour    | 3,000           |
| Overheads | 2,000           |
|           | <u>10,000</u> ✓ |

Subsequent costs are given below:

|           | P            | Q            |
|-----------|--------------|--------------|
| Material  | ₹ 3,000      | ₹ 1,500      |
| Labour    | 1,400        | 1,000        |
| Overheads | 600          | 500          |
|           | <u>5,000</u> | <u>3,000</u> |

Selling prices are: P – ₹ 16,000 and Q – ₹ 8,000

Estimated profits margin on selling prices are 25% for P and 20% for Q.

Assume that selling and distribution expenses are in proportion of sales prices. Show how you would apportion joint costs of manufacture and prepare a statement showing cost of production of P and Q.

**Solution**

### Statement of Cost

| Particulars                                     | Product P                    | Product Q                   |
|-------------------------------------------------|------------------------------|-----------------------------|
| Sales                                           | 16,000                       | 8,000                       |
| Less: Profit                                    | $16,000 \times 25\% = 4,000$ | $8,000 \times 20\% = 1,600$ |
| Total Cost                                      | 12,000                       | 6,400                       |
| Less: Selling expenses (w.n. – 1) [400 in 16:8] | 267                          | 133                         |
| Work Cost                                       | 11,733                       | 6,267                       |
| Less: Further Processing Cost                   | 5,000                        | 3,000                       |
| Share of Joint Cost                             | 6,733                        | 3,267                       |

### Working Note-1

Total sales = Total Joint Cost + Total Further Processing Cost + Total Selling Expenses + Total Profit

$$24,000 = 10,000 + 8,000 + \text{Total Selling Expenses} + 5,600$$

$$\text{Total Selling Expenses} = ₹ 400$$

$$\text{Ratio of sales} = 16,000 : 8,000 = 2:1$$

$$\text{Selling expenses of P} = 400 \times (2/3) = ₹ 267$$

$$\text{Selling expenses of Q} = 400 \times (1/3) = ₹ 133$$

### Statement of Cost of Production

| Particulars                      | Product P     | Product Q    |
|----------------------------------|---------------|--------------|
| <b>Joint Cost:</b>               |               |              |
| Material (5,000 in 6,733:3,267)  | 3,367         | 1,633        |
| Labour (3,000 in 6,733:3,267)    | 2,020         | 980          |
| Overheads (2,000 in 6,733:3,267) | 1,347         | 653          |
| <b>Further Processing Cost:</b>  |               |              |
| Material                         | 3,000         | 1,500        |
| Labour                           | 1,400         | 1,000        |
| Overheads                        | 600           | 500          |
| <b>Cost of Production</b>        | <b>11,733</b> | <b>6,267</b> |

### Question – 3

The SK Oil company purchase crude vegetable oil. It does refining of the same. The refining process results in four products at the split off point: M, N, O & P.

Product O is fully processed at the split off point. Product M, N, & P can be individually further refined into 'Super M', 'Super N' and 'Super P'. In the most recent month (October), the output at split off point was:

|           |                  |
|-----------|------------------|
| Product M | 3,00,000 gallons |
| Product N | 1,00,000 gallons |
| Product O | 50,000 gallons   |
| Product P | 50,000 gallons   |

The joint cost of the purchasing the crude vegetable oil and Processing it were ₹ 40,00,000. Sunshine had no beginning or ending inventories. Sales of Product O in October were ₹ 20,00,000. Total output of products M, N and P was further refined and then sold. Data related to October are as follows:

| Product | Further processing cost to make super products | Sales         |
|---------|------------------------------------------------|---------------|
| Super M | ₹ 80,00,000                                    | ₹ 1,20,00,000 |
| Super N | ₹ 32,00,000                                    | ₹ 40,00,000   |
| Super P | ₹ 36,00,000                                    | ₹ 48,00,000   |

Sunshine had the option of selling products M, N and P at the split off point. This alternative would have yielded the following sales for the October, production:

|           |             |
|-----------|-------------|
| Product M | ₹ 20,00,000 |
| Product N | ₹ 12,00,000 |
| Product P | ₹ 28,00,000 |

You are required to answer:

- (a) How the joint cost of ₹ 40,00,000 would be allocated between each product under the following methods

- (i) Sales value at split off point  
(ii) Physical output (gallon)  
(iii) Estimated net realizable value
- (b) Could sunshine have increased its October operating profits by making different decisions about the further refining of product M, N or P? Show the effect of any change you recommend on operating profits.

### Solution

#### (a) (i) Statement of Cost (₹ in lakhs)

| Particulars                                | Product M | Product N | Product O | Product P |
|--------------------------------------------|-----------|-----------|-----------|-----------|
| Sale value at split off                    | ✓ 20      | ✓ 12      | ✓ 20      | ✓ 28      |
| Share of Joint Cost<br>(40 in 20:12:20:28) | → 10      | 6         | 10        | 14        |

#### (a) (ii) Statement of Cost (₹ in lakhs)

| Particulars                                | Product M | Product N | Product O | Product P |
|--------------------------------------------|-----------|-----------|-----------|-----------|
| Physical Output                            | ✓ 3       | ✓ 1       | ✓ 0.50    | ✓ 0.50    |
| Share of Joint Cost<br>(40 in 3:1:0.5:0.5) | → 24      | 8         | 4         | 4         |

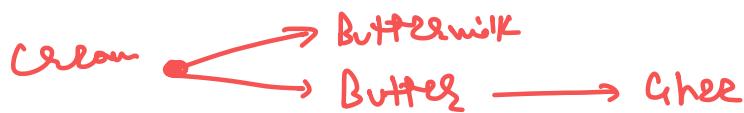
#### (a) (iii) Statement of Cost (₹ in lakhs)

| Particulars                               | Product M | Product N | Product O | Product P |
|-------------------------------------------|-----------|-----------|-----------|-----------|
| Sale value after FPC                      | → ✓ 120   | ✓ 40      | ✓ 20      | ✓ 48      |
| Less: Further Processing cost             | → - 80    | → - 32    | -         | → - 36    |
| Less: Selling expenses                    | → -       | -         | -         | -         |
| Net Realizable Value                      | → 40      | 8         | 20        | 12        |
| Share of Joint Cost<br>(40 in 40:8:20:12) | → 20      | 4         | 10        | 6         |

#### (b) Statement of Incremental Profit/(Loss) (₹ in lakhs)

| Particulars                   | Product M | Product N | Product P |
|-------------------------------|-----------|-----------|-----------|
| Sales after FPC               | → 120     | 40        | 48        |
| Less: Sale at Split off       | → 20      | 12        | 28        |
| Incremental Sales             | → 100 ✓   | 28 ✓      | 20 ✓      |
| Less: Further Processing Cost | 80 ✓      | 32 ✓      | 36 ✓      |
| Incremental Profit/(Loss)     | 20        | (4)       | (16)      |

Thus, it is recommended that Product M should be further processed into Super M and Product N & P should be sold at split off point without any further processing. With this suggestion, company's operating profit will rise by ₹ 20,00,000 as the existing losses of ₹ 4,00,000 and ₹ 16,00,000 will get cut down.



#### Question – 4

SK Ltd. is engaged in the production of Buttermilk, Butter and Ghee. It purchases processed cream and let it through the process of churning until it separates into buttermilk and butter. For the month of May, 2021, SK Ltd. purchased 50 kilolitre processed cream @ ₹ 100 per 1,000 ml. Conversion cost of ₹ 1,00,000 were incurred up-to the split off point, where two saleable products were produced i.e. buttermilk and butter. Butter can be further processed into Ghee.

The May, 2021 production and sales information is as follows:

| Products   | Production (in Kilolitre/tonne) | Sales Quantity (in Kilolitre/tonne) | Selling price per litre/kg (₹) |
|------------|---------------------------------|-------------------------------------|--------------------------------|
| Buttermilk | 28                              | 28                                  | 30                             |
| Butter     | 20                              | -                                   | -                              |
| Ghee       | 16                              | 16                                  | 480                            |

All 20 tonne of butter were further processed at an incremental cost of ₹ 1,20,000 to yield 16 Kilolitre of Ghee. There was no opening or closing inventories of buttermilk, butter or ghee in May, 2021.

Required:

- Show how joint cost would be apportioned between Buttermilk and Butter under estimated net realizable value method.
- MP Ltd. offers to purchase 20 tonne of butter in June at ₹ 360 per kg. In case SK Ltd. accepts this offer, no Ghee would be produced in June. Suggest whether SK Ltd. shall accept the offer affecting its operating income or further process butter to make Ghee itself?

#### Solution

- Total Joint Cost = Processed cream cost + conversion cost  

$$= (50 \times 1,000 \times 100) + 1,00,000 = ₹ 51,00,000$$

##### Statement of Joint Cost

| Particulars                                                | Buttermilk Amount (₹)                  | Butter Amount (₹)                        |
|------------------------------------------------------------|----------------------------------------|------------------------------------------|
| Sales Value →                                              | $30 \times 28 \times 1,000 = 8,40,000$ | $16 \times 1,000 \times 480 = 76,80,000$ |
| Less: Post split-off cost →                                | -                                      | (1,20,000)                               |
| Net Realizable Value →                                     | 8,40,000                               | 75,60,000                                |
| Apportionment of Joint Cost of ₹ 51,00,000 in ratio of 1:9 | 5,10,000                               | 45,90,000                                |

- Statement of Incremental Profit or Loss

| Particulars             | (₹)                                      |
|-------------------------|------------------------------------------|
| Revenue from Ghee →     | $16 \times 1,000 \times 480 = 76,80,000$ |
| (-) Revenue from Butter | $20 \times 1,000 \times 360 = 72,00,000$ |
| Incremental Revenue →   | 4,80,000                                 |

|                             |            |
|-----------------------------|------------|
| (-) Further processing cost | ✓ 1,20,000 |
| Incremental Profit          | → 3,60,000 |

The operating income of SK Ltd. will be reduced by ₹ 3,60,000 in June if it sells 20 tonne of Butter to MP Ltd., instead of further processing of Butter into Ghee for sale. Thus, SK Ltd. is advised not to accept the offer and further process butter to make Ghee itself.

### Question – 5

A Factory produces two products, 'A' and 'B' from a single process. The joint processing costs during a particular month are:

|                    |            |        |
|--------------------|------------|--------|
| Direct material    | → ₹ 30,000 | } (JC) |
| Direct labour      | → ₹ 9,600  |        |
| Variable Overheads | → ₹ 12,000 |        |
| Fixed Overheads    | → ₹ 32,000 |        |

Sales: A – 100 units @ ₹ 600 per unit; B – 120 units @ ₹ 200 per unit.

Apportion joint costs on the basis of:

- Physical Quantity of each product.
- Contribution Margin method, and
- Determine Profit or Loss under both the methods.

### Solution

#### (i) Statement showing Joint Cost Apportionment (Physical Quantity Basis)

| Particulars                            | A (₹)         | B (₹)         |
|----------------------------------------|---------------|---------------|
| Direct Material (30,000 in 100:120)    | 13,636        | 16,364        |
| Direct Labour (9,600 in 100:120)       | 4,364         | 5,236         |
| Variable Overheads (12,000 in 100:120) | 5,455         | 6,545         |
| Fixed Overheads (32,000 in 100:120)    | 14,545        | 17,455        |
| <b>Joint Cost Allocable</b>            | <b>38,000</b> | <b>45,600</b> |

#### (ii) Statement showing Contribution

| Particulars                                  | A (₹)         | B (₹)          |
|----------------------------------------------|---------------|----------------|
| Sales (100 × 600) (120 × 200)                | 60,000        | 24,000         |
| Less: Direct Material (30,000 in 100:120)    | 13,636        | 16,364         |
| Less: Direct Labour (9,600 in 100:120)       | 4,364         | 5,236          |
| Less: Variable Overheads (12,000 in 100:120) | 5,455         | 6,545          |
| <b>Contribution</b>                          | <b>36,545</b> | <b>(4,145)</b> |

**Statement showing Joint Cost Apportionment (Contribution Margin Method)**

| Particulars                            | A (₹)         | B (₹)         |
|----------------------------------------|---------------|---------------|
| Direct Material (30,000 in 100:120)    | → 13,636      | 16,364        |
| Direct Labour (9,600 in 100:120)       | → 4,364       | 5,236         |
| Variable Overheads (12,000 in 100:120) | → 5,455       | 6,545         |
| Fixed Overheads                        | 32,000        | -             |
| <b>Joint Cost Allocable</b>            | <b>55,455</b> | <b>28,145</b> |

**(iii) Statement showing Profit or Loss (Under Physical Quantity Basis)**

| Particulars                   | A (₹)         | B (₹)           |
|-------------------------------|---------------|-----------------|
| Sales (100 × 600) (120 × 200) | → 60,000      | 24,000          |
| Less: Joint Cost Allocable    | → 38,000      | 45,600          |
| <b>Profit or (Loss)</b>       | <b>22,000</b> | <b>(21,600)</b> |

**Statement showing Profit or Loss (Under Contribution Margin Method)**

| Particulars                   | A (₹)        | B (₹)          |
|-------------------------------|--------------|----------------|
| Sales (100 × 600) (120 × 200) | → 60,000     | 24,000         |
| Less: Joint Cost Allocable    | → 55,455     | 28,145         |
| <b>Profit or (Loss)</b>       | <b>4,545</b> | <b>(4,145)</b> |

**Question – 6**

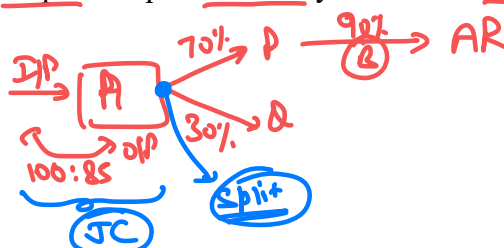
A Company produces two joint products P and Q in 70:30 ratio from basic raw materials in department A. The input output ratio of department A is 100:85. Product P can be sold at the split off stage or can be processed further at department B and sold as product AR. The input output ratio is 100:90 of department B. The department B is created to process product P only and to make it product AR.

The selling prices per kg are as under:

Product P → ₹ 85 ✓

Product Q → ₹ 290 ✓

Product AR → ₹ 115 ✓



The production will be taken up in the next month.

Raw materials 8,00,000 kgs

Purchase price ₹ 80 per kg

$$8 \times 80 = 640 \text{ Lacs} + 150 \text{ Lacs} = 790 \text{ Lacs} \rightarrow \text{JC}$$

|                   | Deptt. A (₹ Lacs) | Deptt. B (₹ Lacs) |
|-------------------|-------------------|-------------------|
| Direct materials  | ~ 35.00           | 5.00 (FPC)        |
| Direct labour     | ~ 30.00           | 9.00              |
| Variable overhead | ~ 45.00           | 18.00             |
| Fixed overheads   | ~ 40.00           | 32.00             |

|                  |           |          |
|------------------|-----------|----------|
| Total            | 150.00    | 64.00    |
| Selling Expenses | ₹ in lacs |          |
| Product P        | 24.60     | → Saving |
| Product Q        | 21.60     |          |
| Product AR       | 16.80     |          |

Required:

- Prepare a statement showing the apportionment of joint costs if Joint Costs are apportioned in the proportion of NRV at Split-off point.
- State whether it is advisable to produce product AR or not.

**Solution**

(a) Input in Department A = 8,00,000 units

Output in Department A =  $8,00,000 \times 85\% = 6,80,000$  units

Output of Product P =  $6,80,000 \times (70/100) = 4,76,000$  units

Output of Product Q =  $6,80,000 \times (30/100) = 2,04,000$  units

**Statement of Joint Cost**

| Particulars                           | Amount (₹ in lakhs) |
|---------------------------------------|---------------------|
| Raw Material ( $8,00,000 \times 80$ ) | 640                 |
| Direct materials                      | 35                  |
| Direct labour                         | 30                  |
| Variable overheads                    | 45                  |
| Fixed overheads                       | 40                  |
| <b>Total Joint Cost</b>               | <b>790</b>          |

**Statement of Apportionment of Joint Cost**

(₹ in lakhs)

| Particulars                              | Product P                 | Product Q                  |
|------------------------------------------|---------------------------|----------------------------|
| Sale at split off                        | $4.76 \times 85 = 404.60$ | $2.04 \times 290 = 591.60$ |
| Less: Selling expenses                   | 24.60                     | 21.60                      |
| <b>Net realizable value at split off</b> | <b>380</b>                | <b>570</b>                 |
| Share of Joint Cost                      | <b>316</b>                | <b>474</b>                 |
| (790 in 38:57)                           |                           |                            |

**(b) Statement of Evaluation of Proposal**

| Particulars                                                                  | Amount (₹ in lakhs) |
|------------------------------------------------------------------------------|---------------------|
| Sales after further processing cost (w.n.-1) $[4.76 \times 90\% \times 115]$ | 492.66              |
| (-) Sale at split off                                                        | 404.60              |
| Incremental sales                                                            | 88.06               |
| (-) Further processing cost                                                  | (64)                |
| (+) Savings in selling expenses $(24.60 - 16.80)$                            | 7.80                |
| <b>Net Benefit</b>                                                           | <b>31.86</b>        |

Since there is net benefit, thus it is recommended to further process Product P into Product AR.

**Working note – 1**

Input in Department B = 4,76,000 units

Output in Department B i.e. Product AR =  $4,76,000 \times 90\% = 4,28,400$  units

Sale value after further processing cost =  $115 \times 4.284$  lakhs = ₹ 492.66 lakhs

# Joint & By-Product

## MCQs

Q(1). In sugar manufacturing industries molasses is also produced along with sugar. Molasses may be of smaller value as compared with the value of sugar and is known as:

- A. common product
- ☒ B. By-product
- C. Joint product
- D. None of them

Q(2). Method of apportioning joint costs on the basis of output of each joint product at the point of split off is:

- A. Sales value method
- ☒ B. Physical unit method
- C. Average cost method
- D. Marginal cost and contribution method

Q(3). In the Net realisable value method, for apportioning joint costs over the joint products, the basis of apportionment would be:

- A. Selling price per unit of each of the joint products
- ☒ B. Selling price multiplied by units sold of each of the joint products
- ☒ C. Sales value of each joint product less further processing costs for individual products
- ☒ D. Both (b) and (c)

Q(4). The main purpose of accounting of joint products and by-products is to:

- A. Determine the opportunity cost
- B. Determine the replacement cost
- ☒ C. Determine profit or loss on each product line
- D. None of the above

Q(5). Under net realizable value method of apportioning joint costs to joint products, the selling & distribution cost is:

- A. Added to joint cost
- B. Deducted from further processing cost
- ☒ C. Deducted from sales value
- D. Ignored

Q(6). Which of the following is a co-product

- A. Diesel and petrol in an oil refinery
- B. Edible oils and oil cakes
- C. Cured and butter in a dairy
- ☒ D. Mustard oil and sunflower oil in an oil processing company

Q(7). Which of the following is an example of by-product.

- A. Diesel and Petrol in an oil refinery
- ☒ B. Edible oils and oil cakes
- C. Curd and butter in a dairy
- D. Mustard seeds and mustard oil

Q(8). Which of following method can be used when the joint products are of unequal quantity and used for captive consumption:

- ☒ A. Technical estimates, using market value of similar goods
- B. Net Realisable value method
- C. Physical units method
- D. Market value at split-off method

Q(9). Which of the following statement is not correct in relation to Co-products:

- A. Co-products may also have joint products
- B. Costing for co-products are done according to process costing method
- ☒ C. Co-products do not have any by-products
- D. Co-products are treated as a separate cost object for costing purpose.

Q(10). When a by-product does not have any realisable value, the cost of by-product is:

- A. Transferred to costing Profit & Loss A/c
- ☒ B. By-product cost is borne by the good units
- C. By-product is ignored
- D. By-product cost is determined taking value of similar goods

Q(11). SG Ltd. manufactures two products from a joint milling process. The two products developed are Mine support (MS) and commercial building (CB). A standard production run incurs joint costs of ₹ 1,00,000 and results in 60,000 units of MS and 90,000 units of CB. Each MS sells for ₹ 200 per unit, and each CB sells for ₹ 450 per unit.

Assuming no further processing work is done after the split-off point, the amount of joint cost allocated to commercial building (CB) on a physical quantity allocation basis would be:

☒ A. ₹ 60,000

B. ₹ 1,80,000

C. ₹ 2,25,000

D. ₹ 1,20,000

$$10 \times 90 = 60,000$$

Q(12). Kay company manufactures two hair care lotions, Livi and Sili, out of a joint process. The joint (common) costs incurred are ₹ 6,30,000 for a standard production run that generates 1,80,000 gallons of Livi and 1,20,000 gallons of Sili. Livi sells for ₹ 240 per gallon, and Sili sells for ₹ 390 per gallon.

If additional processing costs beyond the split-off point are ₹ 140 per gallon for Livi and ₹ 90 per gallon for Sili, the amount of joint cost of each production run allocated to Livi on a physical-quantity basis is:

A. ₹ 3,40,000

☒ B. ₹ 3,78,000

C. ₹ 2,32,000

D. ₹ 5,80,000

$$6.30 \times \frac{1.80}{(1.80+1.20)} = 3.78$$

Q(13). For the purpose of allocating joint costs to joint products, the sales price at point of sale, reduced by cost to complete after split-off, is assumed to be equal to the:

☒ A. Joint costs

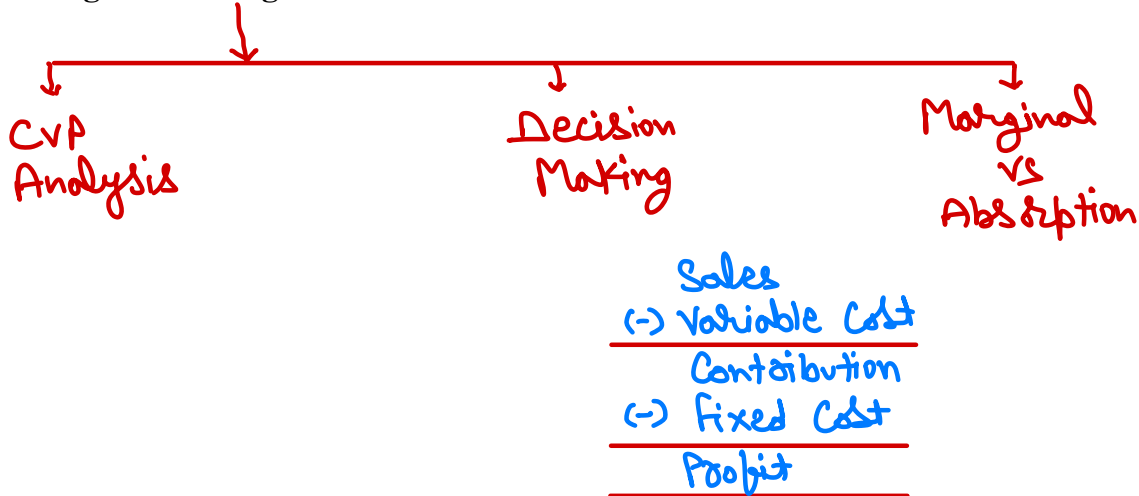
B. Sales price less a normal profit margin at point of sale

C. Net sales value at split off

D. Total costs

# MARGINAL COSTING - CONCEPTS

## 1. Marginal Costing



## 2. Cost Volume Profit (CVP) Analysis

## 3. Contribution = Sales – Variable Cost

## 4. Profit Volume (PV) Ratio or Contribution Ratio

This ratio doesn't change with change in level of output

This ratio changes with change in either selling price per unit or variable cost per unit

$$\text{PV Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{\text{Sales} - \text{Variable Costs}}{\text{Sales}} \times 100 = \frac{\text{Fixed cost} + \text{Profit}}{\text{Sales}} \times 100$$

$$\text{PV Ratio} = 100 - \text{Variable Cost Ratio}$$

$$\text{PV Ratio} = \frac{\text{Change in Contribution}}{\text{Change in Sales}} \times 100 = \frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100$$

(If data of two levels)

$$\text{VC Ratio} = \frac{\text{VC}}{\text{Sales}} \times 100$$

## 5. Break-even point (BEP)

It is the level of sales at which there is neither any profit nor any sales

In other words, it is the level of sales at which contribution is just able to recover FC.

$$\text{Break-even Point (units of sale)} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}} \quad \checkmark$$

$$\text{Break-even Point (in sales value)} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}} = \text{Break-even point units} \times \text{Selling price per unit}$$

## 6. Cash Break-even Point

It is level of sales at which cash profit or loss is zero.

$$\text{Cash Break-even Point (units of sale)} = \frac{\text{Cash Fixed Cost}}{\text{Contribution per unit}} \quad \checkmark$$

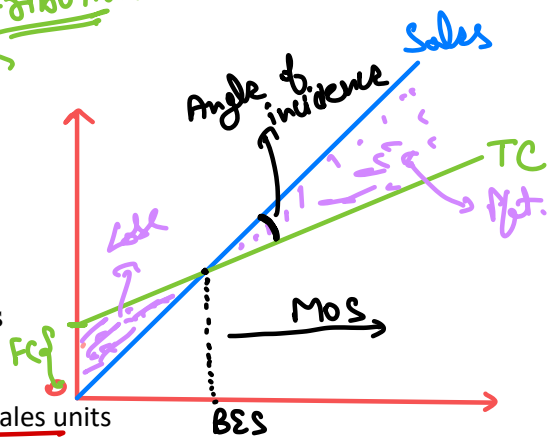
$$\text{Cash Break-even Point (in sales value)} = \frac{\text{Cash Fixed Cost}}{\text{P/V Ratio}} \quad \checkmark$$

| <u>Level of Sales</u> | <u>Situation</u> |
|-----------------------|------------------|
| Sales > BES           | Profit           |
| Sales = BES           | Pft./Loss = 0    |
| Sales < BES           | Loss             |

## 7. Required sales for a given level of profit

$$\text{Sales to earn desired profit (units)} = \frac{\text{Fixed cost} + \text{Desired profit}}{\text{Contribution per unit}}$$

$$\text{Sales to earn desired profit (in ₹)} = \frac{\text{Fixed cost} + \text{Desired profit}}{\text{P/V Ratio}}$$



## 8. Margin of Safety (MOS)

It is the level of sales over and above break-even sales

$$\text{Margin of Safety (in ₹)} = \text{Actual sales} - \text{Break-even sales}$$

$$\text{Margin of Safety (in units)} = \text{Actual sale units} - \text{Break-even sales units}$$

$$\text{Margin of safety (in \%)} = \frac{\text{Margin of safety}}{\text{Total Sales}} \times 100$$

$$\text{Margin of Safety (in \%)} = 100\% - \text{Break-even Sales \%}$$

$$\text{Margin of safety (in ₹)} = \frac{\text{Profit}}{\text{P/V Ratio}}$$

$$\text{Margin of safety (in units)} = \frac{\text{Profit}}{\text{Contribution per unit}}$$

## 9. Points to Remember (PTRs)

(A) If fixed cost per unit is given then multiply it with the level of units at which such fixed cost per unit was computed.

(B) Apply price effect of Total FC and never apply on FC per unit

## 10. Dual Selling price or Dual variable cost questions

Dual Contribution Per unit

- 1) Find both Cont. P.v.
- 2) First calculate total Cont. from 1st option which will be sold first.
- 3) Recover the required value from this on then calculate the bal. required value.

## 11. Composite or Overall BEP

This concept is used when company deals in multiple products.

| Part.          | A   | B   | C   | Total |
|----------------|-----|-----|-----|-------|
| Sales          | ✓   | ✓   | ✓   | ✓     |
| (-) VC         | (-) | (-) | (-) | (-)   |
| Contrib.       | ✓   | ✓   | ✓   | ✓     |
| (-) Fixed cost |     |     |     | ✓     |
| Profit         |     |     |     | ✓     |

- ④ weights will be Sales % of each product out of total Sales  
 ⑤ Sales mix

$$\text{Overall Contribution per unit} = \text{Weighted average of contribution per unit} = \frac{\text{Total Contribution}}{\text{Total Units}}$$

$$\text{Overall P/V Ratio} = \text{Weighted average of P/V Ratio} = \frac{\text{Total Contribution}}{\text{Total Sales}} \times 100$$

$$\text{Overall Break-even Point (in units)} = \frac{\text{Fixed Cost}}{\text{Overall Contribution Per unit}}$$

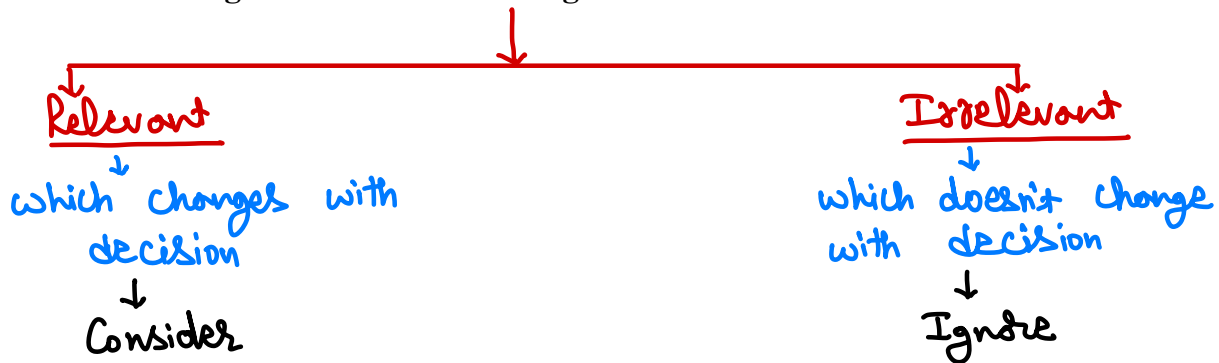
$$\text{Overall Break-even Point (in ₹)} = \frac{\text{Fixed Cost}}{\text{Overall P/V Ratio}}$$

for Product wise BEP, distribute this in ratio of Sales mix.

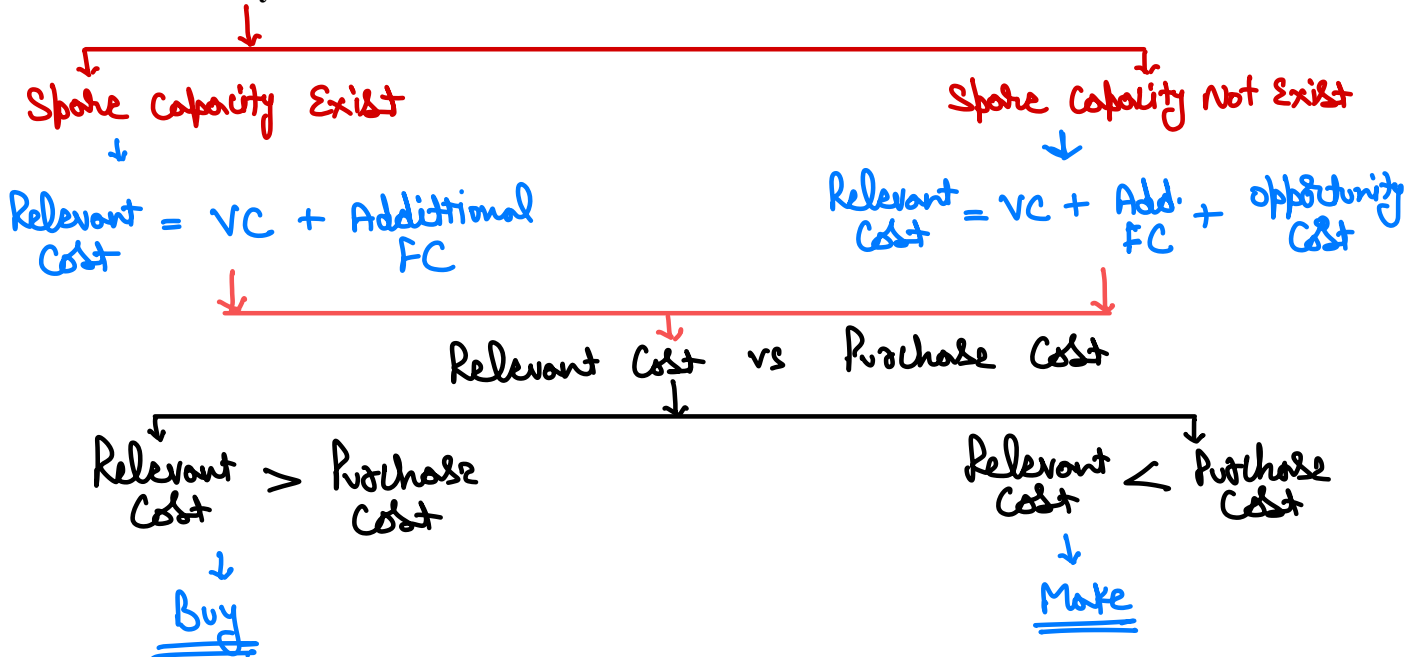
$$12. \text{ Activity level \% at BES} = \frac{\text{Break-even sales}}{\text{Total Sales at 100\% level}} \times 100$$

$$13. \text{ Shut down point} = \frac{\text{Avoidable fixed cost}}{\text{Contribution per unit or PV Ratio}}$$

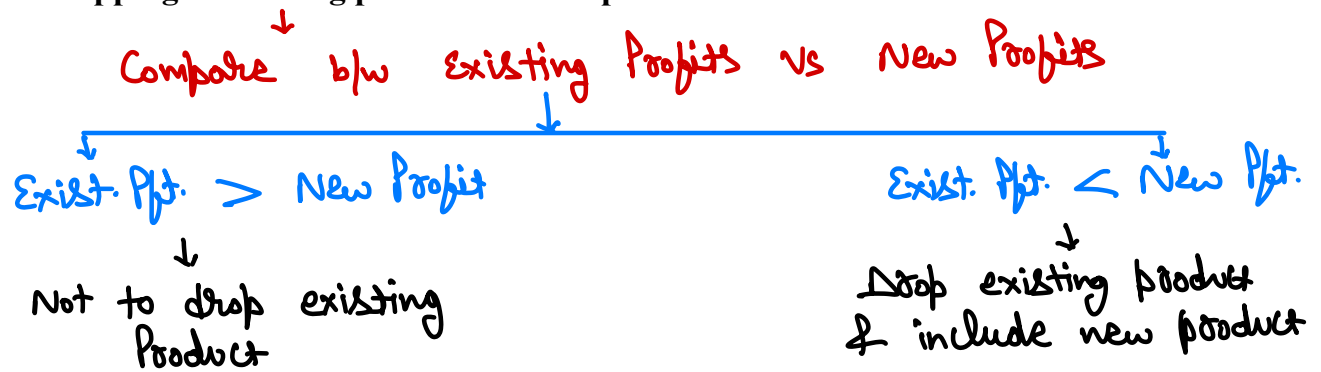
#### 14. Cost with regard to decision making



#### 15. Make vs Buy



## 16. Dropping an existing product for new product



## 17. Key factor or limiting factor

It is the factor which is limited in its availability

Decision will be taken on the basis of contribution per unit of key factor

| <u>Key Factor</u>          | <u>Basis of Decision</u>                   |
|----------------------------|--------------------------------------------|
| → Sales (in <u>units</u> ) | → Contribution per unit                    |
| → Sales (in <u>₹</u> )     | → P/V Ratio                                |
| → <u>Material</u>          | → Contribution per <u>unit of material</u> |
| → <u>Labour hour</u>       | → Contribution per <u>labour hour</u>      |
| → <u>Machine hour</u>      | → Contribution per <u>machine hour</u>     |

## 18. Indifference Level

Level at which cost of two options will be equal

$$\text{Indifference level} = \frac{\text{Difference in Fixed cost} \checkmark}{\text{Difference in variable cost per unit} \checkmark}$$

option-1)  $VC_1$  P.v. &  $FC_1$       option-2)  $VC_2$  P.v. &  $FC_2$   
Let at 'y' units both options cost will be equal.

$$\begin{aligned} \text{TC of option-1} &= \text{TC of option-2} \\ (y)(VC_1) + FC_1 &= (y)(VC_2) + FC_2 \\ (y)(VC_1) - (y)(VC_2) &= FC_2 - FC_1 \end{aligned}$$

$$y = \frac{FC_2 - FC_1}{VC_1 - VC_2} = \frac{\text{Diff. in FC}}{\text{Diff. in VC P.V.}}$$

| Level                                  | Recommendation                                     |
|----------------------------------------|----------------------------------------------------|
| Actual quantity $>$ Indifference level | Select option having variable cost per unit is low |
| Actual quantity $<$ Indifference level | Select option where fixed cost is low              |
| Actual quantity $=$ Indifference level | Select any option                                  |

In case if there are three 3 options, then compute as follows:

- (a) Case 1 & 2 ✓
- (b) Case 2 & 3 ✓
- (c) Case 1 & 3 ✓

### 19. Income statement under Marginal Costing

| Particulars                                                                                                                                     | Amount      |
|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Revenue (A) ✓                                                                                                                                   | -           |
| Direct Material ✓                                                                                                                               | -           |
| Direct Labour ✓                                                                                                                                 | -           |
| Direct expenses ✓                                                                                                                               | -           |
| Variable manufacturing overheads                                                                                                                | -           |
| ✓ Variable GFC/NFC/COP                                                                                                                          | -           |
| Add: Opening stock of finished goods }<br>Less: Closing stock of finished goods }                                                               | -<br>-      |
| → Variable COGS                                                                                                                                 | -           |
| Add: Variable administration overheads                                                                                                          | -           |
| Add: Variable selling & distribution overheads                                                                                                  | -           |
| → Variable COS (B) ✓                                                                                                                            | -           |
| Contribution (A – B)                                                                                                                            | -           |
| Less: Fixed manufacturing overheads }<br>Less: Fixed administration overheads }<br>Less: Fixed selling & distribution overheads } <u>Actual</u> | -<br>-<br>- |
| Profit                                                                                                                                          | -           |

### 20. Income statement under Absorption Costing

| Particulars                                                                       | Amount |
|-----------------------------------------------------------------------------------|--------|
| Revenue (A)                                                                       | -      |
| Direct Material ✓                                                                 | -      |
| Direct Labour ✓                                                                   | -      |
| Direct expenses ✓                                                                 | -      |
| Variable manufacturing overheads                                                  | -      |
| Fixed manufacturing overheads → on Recovery Rate Basis                            | -      |
| GFC/NFC/COP                                                                       | -      |
| Add: Opening stock of finished goods }<br>Less: Closing stock of finished goods } | -<br>- |
| → COGS                                                                            | -      |

| Particulars                                                          | Amount |
|----------------------------------------------------------------------|--------|
| Add: <u>Fixed</u> & <u>Variable</u> administration overheads         | -      |
| Add: <u>Fixed</u> & <u>Variable</u> selling & distribution overheads | -      |
| → COS                                                                | -      |
| Add: <u>Under absorbed</u> fixed manufacturing overheads             | -      |
| Less: <u>Over absorbed</u> fixed manufacturing overheads             | -      |
| → Total Cost (B)                                                     | -      |
| <u>Profit/(loss)</u> (A – B)                                         | -      |

## MARGINAL COSTING – QUESTIONS

### Question – 1

AZ company has prepared its budget for the production of 2,00,000 units. The variable cost per unit is ₹ 16 and fixed cost is ₹ 4 per unit. The company fixes its selling price to fetch a profit of 20% on total cost.

You are required to calculate:

- (i) Present break-even sales (in Rs. and in quantity)
- (ii) Present profit-volume ratio
- (iii) Revised break-even sales in Rs and the revised profit-volume ratio, if it reduces its selling price by 10%.
- (iv) What would be revised sales in quantity and the amount, if a company desires a profit increase of 20% more than the budgeted profit and selling price is reduced by 10% as above in point (iii).

### Solution

- (i) Present Fixed cost =  $4 \times 2,00,000 = ₹ 8,00,000$

Present Profit = Total cost  $\times 20\% = (16 + 4) \times 20\% = ₹ 4$

Present Selling price = Cost + Profit =  $(16 + 4) + 4 = ₹ 24$

Contribution = Selling price – Variable cost =  $24 - 16 = ₹ 8$

Present Break-even sales units =  $\frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{8,00,000}{8} = 1,00,000 \text{ units}$

Present Break-even sales value =  $1,00,000 \times 24 = ₹ 24,00,000$

$PV \text{ Ratio} = \frac{8}{24} \times 100 = 33.333\%$

$BES = \frac{80}{33.333\%} = 240$

- (ii) Present profit-volume ratio =  $\frac{\text{Contribution}}{\text{Selling price}} \times 100 = \frac{8}{24} \times 100 = 33.33\%$

- (iii) New Selling price per unit =  $24 - 10\% = ₹ 21.60$

New contribution per unit =  $21.60 - 16 = ₹ 5.60$

Revised PV ratio =  $\frac{5.60}{21.60} \times 100 = 25.93\%$

Revised break-even sales =  $\frac{8,00,000}{25.93\%} = ₹ 30,85,229$

- (iv) Required profit = Existing profit  $\times 120\% = (4 \times 2,00,000) \times 120\% = ₹ 9,60,000$

Required sales quantity =  $\frac{\text{Required profit} + \text{Fixed cost}}{\text{Contribution per unit}} = \frac{9,60,000 + 8,00,000}{5.60} = 3,14,286 \text{ units}$

Required sales value =  $3,14,286 \times 21.60 = ₹ 67,88,578$

### Question – 2

The sales turnover and profit of M/s SK Ltd. during the two years 2017 and 2018 were as follows:

| <u>Year</u> | <u>Sales (₹)</u> | <u>Profit (₹)</u> |
|-------------|------------------|-------------------|
| → 2017      | ✓ 4,50,000       | 60,000            |
| → 2018      | 5,10,000         | 75,000            |

You are required to calculate:

- Profit-Volume Ratio
- Sales at which company will neither lose nor gain anything
- Sales required to earn a profit of ₹ 1,20,000
- The profit made when sales are ₹ 7,50,000
- Minimum level of sales where the company needs not to close the production if unavoidable fixed cost is ₹ 1,00,000. 40000

### Solution

- P/V Ratio =  $\frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100 = \frac{75,000 - 60,000}{5,10,000 - 4,50,000} \times 100 = \frac{15,000}{60,000} \times 100 = 25\%$
- Contribution for Year 2017 =  $4,50,000 \times 25\%$   
 Fixed cost + Profit = 1,12,500 ✓  
 Fixed cost + 60,000 = 1,12,500  
Fixed cost = ₹ 52,500  
 Break-even sales (in ₹) =  $\frac{\text{Fixed Cost}}{\text{P/V Ratio}} = \frac{52,500}{25\%} = ₹ 2,10,000$  ✓
- Desired sales (in ₹) =  $\frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{P/V Ratio}} = \frac{52,500 + 1,20,000}{25\%} = ₹ 6,90,000$
- Given, Sales = ₹ 7,50,000  
 Profit = Contribution – Fixed Cost =  $(7,50,000 \times 25\%) - 52,500 = ₹ 1,35,000$
- Minimum required sales =  $\frac{\text{Fixed cost}}{\text{P/V Ratio}} = \frac{52,500}{25\%} = ₹ 2,10,000$  Ans. ₹ 50,000

### Question – 3

SK Ltd. has furnished the following data for the two years:

|                                            | <u>2017</u>  | <u>2018</u> |
|--------------------------------------------|--------------|-------------|
| Sales                                      | → ₹ 8,00,000 | ?           |
| Profit/volume ratio (P/V Ratio)            | → 50%        | → 37.5%     |
| Margin of safety sales as % of total sales | → 40%        | → 21.875%   |

There has been substantial savings in the fixed cost in the year 2018 due to the restructuring process. The company could maintain its sales quantity level of 2017 in 2018 by reducing the selling price. You are required to calculate the following:

- ✓ Sales for 2018 in ₹
- ✓ Break-even sales for 2018 in ₹
- ✓ Fixed cost for 2018

## Solution

### (a) Year 2017

$$\text{Variable cost ratio} = 100 - \text{P/V Ratio} = 100 - 50\% = 50\%$$

$$\text{Variable cost} = \text{Sales} \times \text{Variable cost ratio} = 8,00,000 \times 50\% = ₹ 4,00,000$$

### Year 2018

✗ Since there is no change in sales quantity and no information has been provided for change in variable cost per unit.

$$\therefore \text{Variable cost of Year 2018} = \text{Variable Cost of Year 2017} = ₹ 4,00,000$$

$$\text{Variable cost ratio} = 100 - \text{P/V Ratio} = 100 - 37.5\% = 62.5\%$$

$$\frac{\text{Variable cost}}{\text{Sales}} = 62.5\%$$

$$\text{Sales} = \text{Variable cost} \div 62.5\%$$

$$\text{Sales} = 4,00,000 \div 62.5\% = ₹ 6,40,000$$

$$(b) \text{ Breakeven sales (in \%)} = 100 - \text{Margin of Safety (in \%)} = 100 - 21.875\% = 78.125\%$$

$$\text{Breakeven sales} = 6,40,000 \times 78.125\% = ₹ 5,00,000$$

$$(c) \text{ Breakeven sales} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$$

$$\text{Fixed cost} = \text{Breakeven sales} \times \text{P/V Ratio} = 5,00,000 \times 37.5\% = ₹ 1,87,500$$

## Question – 4

A company manufactures two types of herbal product S and K. Its budget shows profit figures after apportioning

the fixed joint cost of ₹ 15 lacs in proportion of the numbers of units sold. The budget for 2022, indicates:

|                            | S        | K      |
|----------------------------|----------|--------|
| Profit (₹) →               | 1,50,000 | 30,000 |
| Selling price / unit (₹) → | 200 ✓    | 120    |
| P/V Ratio (%) →            | 40 ✓     | 50     |

Required:

Compute the best option among the following, if the company expects that the number of units to be sold would be equal.

- ✓ (a) Due to exchange in a manufacturing process, the joint fixed cost would be reduced by 15% and the variables would be increase by 7½%.
- ✓ (b) Price of S could be increase by 20% as it is expected that the price elasticity of demand would be unity over the range of price.
- ✓ (c) Simultaneous introduction of both the option, viz. (a) and (b) above.

## Solution

### Working Notes:

$$1) \text{ Contribution per unit of S} = 200 \times 40\% = ₹ 80 \quad ✓$$

$$\therefore \text{Variable cost per unit of S} = 200 - 80 = ₹ 120$$

Contribution per unit of K =  $120 \times 50\% = ₹ 60$  ✓

∴ Variable cost per unit of K =  $120 - 60 = ₹ 60$  ✓

2) Let units sold of S & K = y ✓

Contribution = Fixed cost + Profit

$$80y + 60y = 15,00,000 + 1,50,000 + 30,000$$

$$140y = 16,80,000$$

$$y = 12,000$$

∴ Units sold of each product = 12,000 ✓

(a) Statement of Profit

| Particulars                                                                            | Amount (₹)  |
|----------------------------------------------------------------------------------------|-------------|
| Contribution of S [ $\overset{SP}{200} - (\underset{VC}{120} + 7.5\%) \times 12,000$ ] | ✓ 8,52,000  |
| Contribution of K [ $\{120 - (60 + 7.5\%) \times 12,000\}$ ]                           | ✓ 6,66,000  |
| Total contribution                                                                     | 15,18,000   |
| Less: Fixed Cost (15,00,000 – 15%)                                                     | → 12,75,000 |
| Profit                                                                                 | 2,43,000    |

(b) Existing total sales of S =  $12,000 \times 200 = ₹ 24,00,000$  ✓

New Selling price of S =  $200 + 20\% = ₹ 240$

New quantity of S =  $24,00,000 \div 240 = 10,000$  units ✓

Statement of Profit

| Particulars                                                                          | Amount (₹)  |
|--------------------------------------------------------------------------------------|-------------|
| Contribution of S [ $(\underline{240} - \underline{120}) \times 10,000$ ]            | → 12,00,000 |
| Contribution of K [ $(\underline{120} - \underline{60}) \times \underline{12,000}$ ] | → 7,20,000  |
| Total contribution                                                                   | 19,20,000   |
| Less: Fixed Cost                                                                     | → 15,00,000 |
| Profit                                                                               | 4,20,000    |

(c) Statement of Profit

| Particulars                                                                                           | Amount (₹) |
|-------------------------------------------------------------------------------------------------------|------------|
| Contribution of S [ $\{ \overset{✓}{240} - (\underline{120} + 7.5\%) \} \times \overset{✓}{10,000}$ ] | 11,10,000  |
| Contribution of K [ $\{ 120 - (\underline{60} + 7.5\%) \} \times 12,000$ ]                            | 6,66,000   |
| Total contribution                                                                                    | 17,76,000  |
| Less: Fixed Cost (15,00,000 – 15%)                                                                    | 12,75,000  |
| Profit                                                                                                | 5,01,000   |

A comparison of increase in profit figures under above three options clearly indicates that the option (c) is the best as it has the highest profit of ₹ 5,01,000.

### Question – 5

SK a zero sugar cold drink manufacturing Indian company, is planning to establish a subsidiary company in Nepal to produce coconut flavored juice. Based on the estimated annual sales of 60,000 bottles of the juice, cost studies produced the following estimates for the Nepalese subsidiary:

|                         | Total Annual Costs<br>(₹) | Percent of total annual cost which is<br>variable |
|-------------------------|---------------------------|---------------------------------------------------|
| Material                | 2,70,000                  | 100%                                              |
| Labour                  | 1,97,000                  | 80% + 20% fix                                     |
| Factory Overheads       | 1,20,000                  | 60% + 40% fix                                     |
| Administration Expenses | 52,000                    | 35% + 65% fix                                     |

The Nepalese production will be sold by manufacturer's representative who will receive a commission of 9% of the sale price. No portion of the Indian office expenses is to be allocated to the Nepalese subsidiary. You are required to:

- Compute the sale price per bottle to enable the management to realize an estimated 20% profit on sale proceeds in Nepal
- Calculate the break-even point in rupees value sales and also in number of bottles for the Nepalese subsidiary on the assumption that the sale price is ₹ 14 per bottle.

### Solution

#### (i) Computation of Sale Price Per Bottle

|                                           | (₹)          |
|-------------------------------------------|--------------|
| Variable Cost:                            |              |
| Material                                  | → 2,70,000   |
| Labour (₹ 1,97,000 × 80%)                 | → 1,57,600   |
| Factory Overheads (₹ 1,20,000 × 60%)      | → 72,000     |
| Administrative Overheads (₹ 52,000 × 35%) | → 18,200     |
| Total (A)                                 | → 5,17,800   |
| Fixed Cost:                               |              |
| Labour (₹ 1,97,000 × 20%)                 | 39,400       |
| Factory Overheads (₹ 1,20,000 × 40%)      | 48,000       |
| Administrative Overheads (₹ 52,000 × 65%) | 33,800       |
| Total (B)                                 | → 1,21,200 ✓ |
| Total Cost without commission (A + B)     | → 6,39,000 ✓ |
| Add: Commission (9% of ₹ 9,00,000)        | 81,000       |
| Add: Profit (20% of ₹ 9,00,000)           | 1,80,000     |
| Sales Proceeds (6,39,000 ÷ 71%) (C)       | → 9,00,000   |
| No. of bottles (D)                        | → 60,000     |
| Selling price per bottle (C ÷ D)          | 15           |

(ii) Statement of calculation of break-even point

| Particulars                                                         | Amount (₹)                       |
|---------------------------------------------------------------------|----------------------------------|
| Sale price per bottle                                               | → 14.00                          |
| (-) Variable cost per bottle $\left(\frac{5,17,800}{60,000}\right)$ | → 8.63                           |
| (-) commission per bottle $(14 \times 9\%)$                         | → 1.26                           |
| Contribution per bottle                                             | → 4.11                           |
| Break-even point (in number of bottles)                             | $\frac{1,21,200}{4.11} = 29,489$ |
| Break-even point (in sales value)                                   | $29,489 \times 14 = 4,12,846$    |

### Question – 6

SK Ltd. manufacture and sales its product S-9. The following figures have been collected from cost records of last year for the product S-9:

| Elements of Cost                     | Variable Cost Portion     | Fixed Cost |
|--------------------------------------|---------------------------|------------|
| Direct Material →                    | 30% of Cost of Goods Sold | -          |
| Direct Labour →                      | 15% of Cost of Goods Sold | -          |
| Factory Overheads →                  | 10% of Cost of Goods Sold | ₹ 2,30,000 |
| General & Administration Overheads → | 2% of Cost of Goods Sold  | ₹ 71,000   |
| Selling & Distribution Overhead →    | 4% of Cost of Sales       | → ₹ 68,000 |

Last Year 5,000 units were sold at ₹ 185 per unit. From the given data find the followings:

- ✓ (a) Break-even Sales (in rupees)
- ✓ (b) Profit earned during last year
- ✓ (c) Margin of safety (in %)
- ✓ (d) Profit if the sales were 10% less than the actual sales.
- ✓ (Assume that administration overheads are related with production activity)

### Solution

#### Working Notes:

(i)  $\text{COGS} = \{(\text{DM} - 0.3\text{COGS}) + (\text{DL} - 0.15\text{COGS}) + (\text{FOH} - 0.10\text{COGS} + ₹ 2,30,000) + (\text{G\&AOH} - 0.02\text{COGS} + ₹ 71,000)\}$

$\text{COGS} = 0.57 \text{ COGS} + ₹ 3,01,000$

$\text{COGS} = \frac{3,01,000}{0.43} = ₹ 7,00,000$

(ii)  $\text{COS} = \text{COGS} + (\text{S\&DOH} - 0.04\text{COS} + ₹ 68,000)$

$\text{COS} = ₹ 7,00,000 + (0.04 \text{ COS} + ₹ 68,000)$

$\text{COS} = \frac{7,68,000}{0.96} = ₹ 8,00,000$

(iii) Calculation of Variable Costs:

|                             |                       |   |                 |
|-----------------------------|-----------------------|---|-----------------|
| Direct Material             | ✓ (0.3 × ₹ 7,00,000)  | ₹ | 2,10,000        |
| Direct Labour               | ✓ (0.15 × ₹ 7,00,000) | ₹ | 1,05,000        |
| Factory Overhead            | ✓ (0.10 × ₹ 7,00,000) | ₹ | 70,000          |
| General & Administration OH | ✓ (0.02 × ₹ 7,00,000) | ₹ | 14,000          |
| Selling & Distribution OH   | ✓ (0.04 × ₹ 8,00,000) | ₹ | 32,000          |
|                             |                       | ₹ | <u>4,31,000</u> |

**(iv) Calculation of total Fixed Costs:**

|                             |   |                 |
|-----------------------------|---|-----------------|
| Factory Overhead-           | ₹ | 2,30,000        |
| General & Administration OH | ₹ | 71,000          |
| Selling & Distribution OH   | ₹ | 68,000          |
|                             | ₹ | <u>3,69,000</u> |

(v)  $P/V \text{ Ratio} = \frac{\text{Sales} - \text{Variable Cost}}{\text{Sales}} \times 100 = \frac{(185 \times 5,000) - 4,31,000}{185 \times 5,000} \times 100 = 53.41\%$

(a)  $\text{Break-Even Sales} = \frac{\text{Fixed Costs}}{P/V \text{ ratio}} = \frac{3,69,000}{53.41\%} = ₹ 6,90,882$

(b)  $\text{Profit earned during the last year} = (\text{Sales} - \text{Total Variable Costs}) - \text{Total Fixed Costs}$   
 $= (₹ 9,25,000 - ₹ 4,31,000) - ₹ 3,69,000 = ₹ 1,25,000$

(c)  $\text{Margin of Safety (\%)} = \frac{\text{Sales} - \text{Breakeven}}{\text{Sales}} \times 100 = \frac{9,25,000 - 6,90,882}{9,25,000} \times 100 = 25.31\%$

(d)  $\text{Profit if sales were 10\% less than the actual sales}$   
 $= 90\% (₹ 9,25,000 - ₹ 4,31,000) - ₹ 3,69,000 = ₹ 75,600$

**Question – 7**

SK Ltd. manufactures and sells a single product X whose selling price is ₹ 100 per unit and the variable cost is ₹ 60 per unit.

- (a) If the Fixed Costs for this year are ₹ 24,00,000 and the annual sales are at 60% margin of safety, Calculate the rate of return on sales, assuming an income tax level of 40%.
- (b) For the next year, it is proposed to add another product line Y whose selling price would be ₹ 150 per unit and the variable cost ₹ 100 per unit. The total fixed costs are estimated at ₹ 28,00,000. The sales mix of X : Y would be 5 : 3. Compute the breakeven sales in units for both the products.

**Solution**

(a)  $\text{Contribution per unit} = \text{Selling price} - \text{Variable cost} = ₹ 100 - ₹ 60 = ₹ 40$

$\text{Break-even point} = ₹ \frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{24,00,000}{40} = 60,000 \text{ units}$

$\text{Break-even sale (in \%)} = 100 - \text{Margin of safety} = 100 - 60\% \text{ of sales} = 40\% \text{ of sales}$

$\text{Break-even sales in units} = \frac{40}{100}$

$\frac{60,000}{\text{Actual sale units}} = 0.40$

$\text{Actual sale units} = 1,50,000 \text{ units}$

| Particulars                                                                | ₹           |
|----------------------------------------------------------------------------|-------------|
| Sales Value ( $1,50,000 \times 100$ )                                      | 1,50,00,000 |
| Less: Variable cost ( $1,50,000 \times 60$ )                               | 90,00,000   |
| Contribution                                                               | 60,00,000   |
| Less: Fixed cost                                                           | 24,00,000   |
| Profit                                                                     | 36,00,000   |
| Less: Income tax @ 40%                                                     | 14,40,000   |
| Net Return                                                                 | 21,60,000   |
| Rate of net return on sales ( $\frac{21,60,000}{1,50,00,000} \times 100$ ) | 14.40%      |

(b) Contribution per unit of Product X =  $100 - 60 = ₹ 40$

Contribution per unit of Product Y =  $150 - 100 = ₹ 50$

Overall contribution per unit =  $\left(40 \times \frac{5}{8}\right) + \left(50 \times \frac{3}{8}\right) = ₹ 43.75$

Overall Break-even point =  $\frac{\text{Fixed cost}}{\text{Overall Contribution per unit}} = \frac{28,00,000}{43.75} = 64,000 \text{ units}$

Break-even point of Product X =  $64,000 \times 5/8 = 40,000 \text{ units}$

Break-even point of Product Y =  $64,000 \times 3/8 = 24,000 \text{ units}$

### Question – 8

LR Ltd. is considering two alternative methods to manufacture product it intends to market. The two methods have a maximum output of 50,000 units each and produce identical items with a selling price of ₹ 25 each. The costs are:

|                        | Method – I<br>Semi-Automatic<br>(₹) | Method – II<br>Fully automatic (₹) |
|------------------------|-------------------------------------|------------------------------------|
| Variable cost per unit | 15                                  | 10                                 |
| Fixed costs            | 1,00,000                            | 3,00,000                           |

You are required to calculate:

- Cost Indifference Point in units. Interpret your results.
- The Break-even point of each method in terms of units

$$\frac{\text{Diff. in FC}}{\text{Diff. in VC p.u.}} = \frac{20}{5} = 40,000$$

### Solution

(i) Let cost indifference units = y

Thus, Total cost of Method – I = Total cost of Method – II

$$1,00,000 + 15y = 3,00,000 + 10y$$

$$5y = 2,00,000$$

$$y = 40,000$$

At y = 40,000 units, cost of the two methods will be equal.

If quantity produced is **more than 40,000 units** than option where **variable cost per unit is low** i.e. **Method - II** will have greater benefits in term of cost. If quantity produced is **less than 40,000** units than option with **lowest fixed cost** i.e. **Method - I** will have greater benefits in terms of total cost.

(ii) **Statement of Break-even point**

| Particulars                       | Method – I     | Method - II    |
|-----------------------------------|----------------|----------------|
| Contribution per unit (A)         | $25 - 15 = 10$ | $25 - 10 = 15$ |
| Fixed cost (B)                    | 1,00,000       | 3,00,000       |
| Break-even point (in units) (B÷A) | 10,000         | 20,000         |

**Question – 9**

Two manufacturing companies A and B are planning to merge. The details are as follows:

|                          | A         | B         |
|--------------------------|-----------|-----------|
| Capacity utilization (%) | 90        | 60        |
| Sales (₹)                | 63,00,000 | 48,00,000 |
| Variable Cost (₹)        | 39,60,000 | 22,50,000 |
| Fixed Cost (₹)           | 13,00,000 | 15,00,000 |

Assuming that the proposal is implemented, calculate:

- Break-Even sales of the merged plant and the **capacity utilization at that stage**.
- Profitability of the merged plant at **80% capacity utilization**.
- Sales Turnover of the merged plant to earn a profit of ₹ 60,00,000.
- When the merged plant is working at a capacity to earn a profit of ₹ 60,00,000, what percentage of increase in selling price is required to sustain an increase of 5% in fixed overheads.

**Solution**

(i) **Statement of Profit** (₹ in lakhs)

| Particulars       | Plant A               | Plant B                  | Total |
|-------------------|-----------------------|--------------------------|-------|
| Sales             | $63 \div 90\% = 70$   | $48 \div 60\% = 80$      | 150   |
| (-) Variable Cost | $39.6 \div 90\% = 44$ | $22.5 \div 60\% = 37.50$ | 81.50 |
| Contribution      | 26                    | 42.50                    | 68.50 |
| (-) Fixed Cost    | 13                    | 15                       | 28    |
| Profit            | 13                    | 27.50                    | 40.50 |

$$\text{Overall P\&V Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \frac{68,50,000}{1,50,00,000} \times 100 = 45.67\%$$

$$\text{Overall Break-even point (in ₹)} = \frac{\text{Fixed Cost}}{\text{Overall P\&V Ratio}} = \frac{28,00,000}{45.67\%} = ₹ 61,30,939$$

$$\text{Break-even point capacity} = \frac{\text{Break-even sales}}{\text{Total Sales at 100\% level}} \times 100 = \frac{61,30,939}{1,50,00,000} \times 100 = 40.87\%$$

$$\text{(ii) Sales at 80\% level} = 1,50,00,000 \times 80\% = ₹ 1,20,00,000$$

$$\text{Profit} = \text{Contribution} - \text{Fixed Cost} = (1,20,00,000 \times 45.67\%) - 28,00,000 = ₹ 26,80,400$$

$$(iii) \text{ Desired Sales} = \frac{\text{Fixed Cost} + \text{Desired Profit}}{\text{Overall P/V Ratio}} = \frac{28,00,000 + 60,00,000}{45.67\%} = ₹ 1,92,68,867$$

$$(iv) \text{ Increase in fixed cost} = 28,00,000 \times 5\% = ₹ 1,40,000$$

$$\therefore \text{Percentage increase in selling price} = \frac{1,40,000}{1,92,68,867} \times 100 = 0.726\%$$

### Question – 10

A dairy product company manufacturing baby food with a shelf life of one year furnishes the following information:

- On 1st January, 2019, the company has an opening stock of 20,000 packets whose variable cost is ₹ 180 per packet.
- In 2018, production was 1,20,000 packets and the expected production in 2019 is 1,50,000 packets. Expected sales for 2019 is 1,60,000 packets.
- In 2018, fixed cost per unit was ₹ 60 and it is expected to increase by 10% in 2019. The variable cost is expected to increase by 25%. Selling price for 2019 has been fixed at ₹ 300 per packet.

You are required to calculate the Break-even volume in units for 2019.

### Solution

$$\text{Total fixed cost for year 2019} = 1,20,000 \times 60 \times 110\% = ₹ 79,20,000$$

$$\text{Contribution per unit upto first 20,000 units (Opening stock units)} = 300 - 180 = ₹ 120$$

$$\text{Contribution per unit beyond 20,000 units (After sale of opening stock)} = 300 - (180 \times 125\%) = ₹ 75$$

$$\text{Total contribution on first 20,000 units} = 20,000 \times 120 = ₹ 24,00,000$$

$$\text{Thus, fixed cost recovered from initial sale of 20,000 units} = ₹ 24,00,000$$

$$\text{Balance fixed cost to be recovered} = ₹ 79,20,000 - ₹ 24,00,000 = ₹ 55,20,000$$

$$\text{Units to be sold for recovery of additional fixed cost} = \frac{55,20,000}{75} = 73,600 \text{ units}$$

$$\text{Thus, Break-even point} = 20,000 + 73,600 = 93,600 \text{ units}$$

### Question – 11

SK Ltd. manufactures automobiles accessories and parts. The following are the total cost of processing 2,00,000 units:

|                           |   |                   |           |                                      |
|---------------------------|---|-------------------|-----------|--------------------------------------|
| Direct material cost      | → | ₹ 375 per unit    | } → (471) | 485 - 471 = 14<br>× 20<br><u>280</u> |
| Direct labour cost        | → | ₹ 80 per unit     |           |                                      |
| Variable factory overhead | → | ₹ 16 per unit     |           |                                      |
| Fixed factory overhead    | → | ₹ 500 lakhs (100) |           |                                      |

The purchase price of the component is ₹ 485. The fixed overhead would continue to be incurred even when the component is bought from outside. Required:

- Should be part be made or bought from outside considering that the present facility when released following a buying decision would remain idle?
- In case the released capacity can be rented out to another manufacturer for ₹ 32,00,000 having good demand. What should be the decision?

### Solution

(a) The decision shall be made comparing the marginal cost of making and buying the component. Here the variable cost of making the component is ₹ 471 as compared to buying cost of ₹ 485. The component shall be made by using own production facility as it would save the company ₹ 14 per unit.

(b) If by releasing the production facility the company can earn a rental income of ₹ 32,00,000, then the additional cost of buying from outside and the rental income from releasing the capacity shall be compared for making decision.

Additional cost of buying = ₹ 14 ~~X~~ 2,00,000 units = ₹ 28,00,000

Rental income to be received = ₹ 32,00,000

Additional benefit = ₹ 4,00,000

The component should be bought from outside as it would save the company ₹ 4,00,000 in fixed cost.

### Question – 12

Moon Ltd. produces products 'X', 'Y' and 'Z' and has decided to analyse its production mix in respect of these three products – 'X', 'Y' and 'Z'.

You have the following information:

|                                   | <u>X</u> | <u>Y</u> | <u>Z</u> |
|-----------------------------------|----------|----------|----------|
| Direct materials (₹) per unit →   | 160      | 120      | 80       |
| Variable overheads (₹) per unit → | 8        | 20       | 12       |

Direct labour:

| <u>Departments:</u> | <u>Rate per hour (₹)</u> | <u>Hours per unit</u> | <u>Hours per unit</u> | <u>Hours per unit</u> |
|---------------------|--------------------------|-----------------------|-----------------------|-----------------------|
|                     |                          | <u>X</u>              | <u>Y</u>              | <u>Z</u>              |
| Department-A        | 4                        | 6                     | 10                    | 5                     |
| Department-B        | 8                        | 6                     | 15                    | 11                    |

From the current budget, further details are as below:

|                                                                                    | <u>X</u> | <u>Y</u> | <u>Z</u> |
|------------------------------------------------------------------------------------|----------|----------|----------|
| Annual production at present ( <u>in units</u> ) →                                 | 10,000   | 12,000   | 20,000   |
| Estimated <u>selling price per unit (₹)</u> →                                      | 312      | 400      | 240      |
| <u>Sales department estimate of possible sales in the coming year (in units)</u> → | 12,000   | 16,000   | 24,000   |

There is a constraint on supply of labour in Department-A and its manpower cannot be increase beyond its present level.

Required:

- Identify the best possible product mix of Moon Ltd.
- Calculate the total contribution from the best possible product

### Solution

Present supply of labour hours in Department-A ✓

$$= (10,000 \times 6) + (12,000 \times 10) + (20,000 \times 5) = 2,80,000 \text{ labour hours}$$

#### **Statement of Contribution**

| Particulars                     | X                 | Y                   | Z                  |
|---------------------------------|-------------------|---------------------|--------------------|
| Selling price per unit          | 312               | 400                 | 240                |
| (-) Direct material per unit    | 160               | 120                 | 80                 |
| (-) Labour cost per unit        |                   |                     |                    |
| Department A                    | $4 \times 6 = 24$ | $4 \times 10 = 40$  | $4 \times 5 = 20$  |
| Department B                    | $8 \times 6 = 48$ | $8 \times 15 = 120$ | $8 \times 11 = 88$ |
| (-) Variable overheads per unit | 8                 | 20                  | 12                 |
| Contribution per unit           | 72                | 100                 | 40                 |
| Labour hours per unit           | 6                 | 10                  | 5                  |
| Contribution per labour hour    | 12                | 10                  | 8                  |
| Rank                            | I                 | II                  | III                |

#### **Statement of Product Mix and Contribution**

| Product | Units                   | Labour hours per unit | Labour Hours consumed | Contribution (b)                 |
|---------|-------------------------|-----------------------|-----------------------|----------------------------------|
| X       | 12,000                  | 6                     | 72,000                | $72,000 \times 12 = 8,64,000$    |
| Y       | 16,000                  | 10                    | 1,60,000              | $1,60,000 \times 10 = 16,00,000$ |
| Z       | $48,000 \div 5 = 9,600$ | 5                     | (Bal. fig.) 48,000    | $48,000 \times 8 = 3,84,000$     |
|         | 37,600                  |                       | 2,80,000              | 28,48,000 ✓                      |

### Question – 13

The profit for the year of SK Ltd. works out to 12.5% of the capital employed and the relevant figures are as under:

|                    |              |
|--------------------|--------------|
| Sales              | → ₹ 5,00,000 |
| Direct Materials   | → ₹ 2,50,000 |
| Direct Labour      | → ₹ 1,00,000 |
| Variable Overheads | → ₹ 40,000   |
| Capital Employed   | → ₹ 4,00,000 |

$$\text{Pft.} = 40 \times 12.5\%$$

The new Sales Manager who has joined the company recently estimates for next year a profit of about 23% on capital employed, provided the volume of sales is increased by 10% and simultaneously there is an increase in selling price of 4% and an over cost reduction in all the elements of cost by 2%.

Required:

Find out by computing in details the cost and profit for the next year, whether the proposal of sales manager can be adopted.

### Solution

#### Statement of Calculation of Fixed Overheads

| Particulars                             | Amount   |
|-----------------------------------------|----------|
| Sales                                   | 5,00,000 |
| (-) Profit ( $4,00,000 \times 12.5\%$ ) | 50,000   |
| Total Cost                              | 4,50,000 |
| (-) Direct material                     | 2,50,000 |
| (-) Direct labour                       | 1,00,000 |
| (-) Variable overheads                  | 40,000   |
| Fixed overheads                         | 60,000   |

#### Statement of Profit (Proposed Situation)

| Particulars                                                                                       | Amount   |
|---------------------------------------------------------------------------------------------------|----------|
| Sales $[5,00,000 \times \frac{110}{100} \times \frac{104}{100}]$                                  | 5,72,000 |
| (-) Variable cost $[(2,50,000 + 1,00,000 + 40,000) \times \frac{110}{100} \times \frac{98}{100}]$ | 4,20,420 |
| Contribution                                                                                      | 1,51,580 |
| (-) Fixed Overheads ( $68,000 \times \frac{98}{100}$ )                                            | 58,800   |
| Profit                                                                                            | 92,780   |

$$\text{Profit as \% of capital employed} = \frac{92,780}{4,00,000} \times 100 = 23.195\%$$

Since the profit as % of capital employed is increasing, thus it is recommended to accept the proposal.

### Question – 14

SK Ltd. manufactures three different products and the following information has been collected from the books of accounts:

|                   | Products    |       |       |
|-------------------|-------------|-------|-------|
|                   | S           | K     | M     |
| Sales Mix         | 35%         | 35%   | 30%   |
| Selling price     | ₹ 300       | ₹ 400 | ₹ 200 |
| Variable cost     | ₹ 150       | ₹ 200 | ₹ 120 |
| Total Fixed costs | ₹ 18,00,000 |       |       |
| Total Sales       | ₹ 60,00,000 |       |       |

The company has currently under discussion, a proposal to discontinue the manufacture of product M and replace it with Product J, when the following results are anticipated:

|           | Products |     |     |
|-----------|----------|-----|-----|
|           | S        | K   | J   |
| Sales Mix | 50%      | 25% | 25% |

|                   |             |       |       |
|-------------------|-------------|-------|-------|
| Selling price     | ₹ 300       | ₹ 400 | ₹ 300 |
| Variable cost     | ₹ 150       | ₹ 200 | ₹ 150 |
| Total Fixed costs | ₹ 18,00,000 |       |       |
| Total Sales       | ₹ 64,00,000 |       |       |

Required:

- Compute the PV ratio, total contribution, profit and Break-even sales for the existing product mix.
- Compute the PV ratio, total contribution, profit and Break-even sales for the proposed product mix.

### Solution

#### (i) Computation of PV ratio

|                       | Products |     |     |
|-----------------------|----------|-----|-----|
|                       | S        | K   | M   |
| Selling price         | 300      | 400 | 200 |
| Less: Variable cost   | 150      | 200 | 120 |
| Contribution per unit | 150      | 200 | 80  |
| PV ratio              | 50%      | 50% | 40% |

Overall PV Ratio = Weighted average PV ratio =  $(50 \times 0.35) + (50 \times 0.35) + (40 \times 0.30) = 47\%$

Total Contribution = Sales  $\times$  Overall PV Ratio =  $60,00,000 \times 47\% = ₹ 28,20,000$

Total Profit = Contribution – Fixed Cost =  $28,20,000 - 18,00,000 = ₹ 10,20,000$

Break-even Sales =  $\frac{\text{Fixed Cost}}{\text{Overall PV Ratio}} = \frac{18,00,000}{47\%} = ₹ 38,29,787$  ✓

#### (ii) Computation of PV ratio

|                       | Products |     |     |
|-----------------------|----------|-----|-----|
|                       | S        | K   | J ✓ |
| Selling price         | 300      | 400 | 300 |
| Less: Variable cost   | 150      | 200 | 150 |
| Contribution per unit | 150      | 200 | 150 |
| PV ratio              | 50%      | 50% | 50% |

Overall PV Ratio = Weighted average PV ratio =  $(50 \times 0.50) + (50 \times 0.25) + (50 \times 0.25) = 50\%$

Total Contribution = Sales  $\times$  Overall PV Ratio =  $64,00,000 \times 50\% = ₹ 32,00,000$  ✓

Total Profit = Contribution – Fixed Cost =  $32,00,000 - 18,00,000 = ₹ 14,00,000$  ✓

Break-even Sales =  $\frac{\text{Fixed Cost}}{\text{Overall PV Ratio}} = \frac{18,00,000}{50\%} = ₹ 36,00,000$  ✓

### Question – 15

SK Ltd. has a production capacity of 2,00,000 units per year. Normal capacity utilization is reckoned as 90%. Standard variable production costs are ₹ 11 per unit. The fixed costs are ₹ 3,60,000

$$\downarrow$$

$$20 \times 90\% = 1.80$$

$$PF = \frac{3.60}{1.80} = ₹ 2$$

per year. Variable selling costs are ₹ 3 per unit and fixed selling costs are ₹ 2,70,000 per year. The unit selling price is ₹ 20.

In the year just ended on 31<sup>st</sup> March, 2019, the production was 1,60,000 units and sales were 1,50,000 units. The closing inventory on 31<sup>st</sup> March was 20,000 units. The actual variable production costs for the year were ₹ 35,000 higher than the standard.

$$\text{Actual VC} = \text{Std. VC} + 35000$$

- (a) Calculate the profit for the year
- By absorption costing method and
  - By marginal costing method
- (b) Explain the difference in the profits

## Solution

### Working Note

| Particulars    | Year 2019          |
|----------------|--------------------|
| Opening stock  | (Bal. fig.) 10,000 |
| (+) Production | 1,60,000           |
| (-) Sales      | 1,50,000           |
| Closing Stock  | 20,000             |

### (a) Income Statement under Absorption Costing

| Particulars                          | Amount                                                                            |
|--------------------------------------|-----------------------------------------------------------------------------------|
| Sales (A)                            | 1,50,000 × 20 = 30,00,000 ✓                                                       |
| Variable Production Cost             | → 1,60,000 × 11 = 17,60,000 ✓                                                     |
| Under Recovered Variable Prod. Cost  | 35,000 ✓                                                                          |
| Fixed Production                     | $\left( \frac{3,60,000}{2,00,000 \times 90\%} \right) \times 1,60,000 = 3,20,000$ |
| GFC/NFC/COP                          | → 21,15,000 ✓                                                                     |
| (+) Op. Stock FG                     | 10,000 × (11 + 2) = 1,30,000                                                      |
| (-) Cl. Stock FG                     | → $\frac{21,15,000}{1,60,000} \times 20,000 = 2,64,375$ ✓                         |
| COGS                                 | → 19,80,625                                                                       |
| (+) Variable Selling Cost            | → 1,50,000 × 3 = 4,50,000                                                         |
| (+) Fixed Selling Cost               | → 2,70,000                                                                        |
| COS                                  | → 27,00,625                                                                       |
| (+) Under Recovered Fixed Prod. Cost | 3,60,000 - 3,20,000 = 40,000                                                      |
| Total Cost (B)                       | → 27,40,625 ✓                                                                     |
| Profit (A - B)                       | 2,59,375 ✓                                                                        |

### Income Statement under Marginal Costing

| Particulars                         | Year 2019                   |
|-------------------------------------|-----------------------------|
| Sales (A)                           | → 1,50,000 × 20 = 30,00,000 |
| Variable Production Cost            | 1,60,000 × 11 = 17,60,000 ✓ |
| Under recovered variable Prod. Cost | 35,000 ✓                    |

|                             |                                                                     |
|-----------------------------|---------------------------------------------------------------------|
| Variable GFC/NFC/COP        | 17,95,000 ✓                                                         |
| (+) Op. Stock FG            | $10,000 \times \underline{11} = 1,10,000$                           |
| (-) Cl. Stock FG            | $\frac{17,95,000}{1,60,000} \times \underline{20,000} = 2,24,375$ ✓ |
| Variable COGS (B)           | 16,80,625                                                           |
| (+) Variable Selling cost   | $1,50,000 \times \underline{3} = 4,50,000$                          |
| Variable COS (B)            | → 21,30,625                                                         |
| <u>Contribution (A – B)</u> | → 8,69,375                                                          |
| (-) Fixed Production Cost   | → 3,60,000                                                          |
| (-) Fixed Selling Cost      | → 2,70,000                                                          |
| Profit                      | 2,39,375                                                            |

(b) The difference in profit is due to the valuation of stock in both methods.

### Reconciliation St.

|                                 |          |
|---------------------------------|----------|
| Pft. as per Absorption          | 2,59,375 |
| (+) Over valued op. St. in obs. | 20,000   |
| (-) Over valued Cl. St. in obs. | (40,000) |
| Pft. as per Marginal            | 2,39,375 |

# Marginal Costing

## MCQs

Q(1). Under marginal costing the cost of product includes:

- A. Prime cost only
- B. Prime cost and variable overheads
- C. prime cost and fixed overheads
- D. Prime cost and factory overheads

Q(2). Reporting under marginal costing is accomplished by:

- A. Treating all costs as period costs
- B. Eliminating the work-in-progress inventory account
- C. Matching variable costs against revenue and treating fixed cost as period costs
- D. including only variable costs in income statement

Q(3). Period costs are:

- A. Variable costs
- B. fixed costs
- C. Prime costs
- D. Overhead costs

Q(4). When sales and production (in units) are same then profit under:

- A. Marginal costing is higher than that of absorption costing
- B. Marginal costing is lower than that of absorption costing
- C. Marginal costing is equal to that of absorption costing
- D. None of the above

Q(5). When sales exceed production (in units) then profit under:

- A. Marginal costing is higher than that of absorption costing
- B. Marginal costing is lower than that of absorption costing
- C. Marginal costing is equal to that of absorption costing
- D. None of the above

Q(6). The difference between marginal costing and absorption costing is regarding the treatment of:

- A. Prime cost
- B. Fixed overheads
- C. Direct materials
- D. Variable overheads

Q(7). Under profit volume ratio, the term profit

- A. Means the sales proceeds in excess of total costs
- B. Means the same thing as is generally understood
- C. It is a misnomer, it in fact refers to contribution i.e. (sales revenue – variable costs)
- D. None of the above

Q(8). Factors which can change the break-even point:

- A. Change in fixed costs
- B. Change in variable costs
- C. Change in the selling price
- D. All of the above

Q(9). If PV ratio is 40% of sales then what about the remaining 60% of sales:

- A. Profit
- B. Fixed cost
- C. Variable cost
- D. Margin of safety

Q(10). The PV ratio of a product is 0.6 and profit is ₹ 9,000. The margin of safety is:

- A. ₹ 5,400
- B. ₹ 15,000
- C. ₹ 22,500
- D. ₹ 3,600

$$\begin{aligned} \text{MOS} &= \frac{\text{P.F.}}{\text{PV}} \\ &= \frac{9000}{0.6} = 15000 \end{aligned}$$

# BUDGET & BUDGETARY CONTROL - CONCEPTS

## 1. Types of budget

(A) Master Budget → *Summary Budget of entire Org.*

### (B) Period – Wise Budget

Long term budget – Beyond 3 years

Short term budget – 1 to 3 years

Current budget – Upto 1 year

(C) Fixed Budget – Doesn't change with change in units or output

(D) Flexible Budget – Can be changed with change in units or output

*Cost* →  $\begin{matrix} \nearrow VC \\ \rightarrow FC \\ \searrow SVC \end{matrix}$

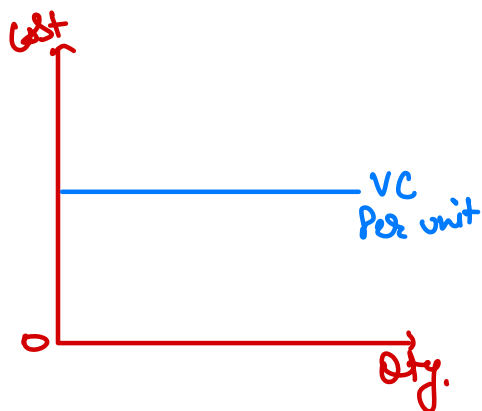
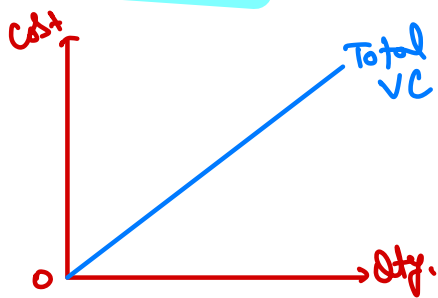
### (E) Function wise Budget

- Sales Budget
- Production Budget
- Material Consumption Budget
- Material Purchase Budget
- Labour Budget
- Overheads Budget
- Capital budget
- Cash Budget
- Plant Utilization Budget
- Research & Development Cost Budget

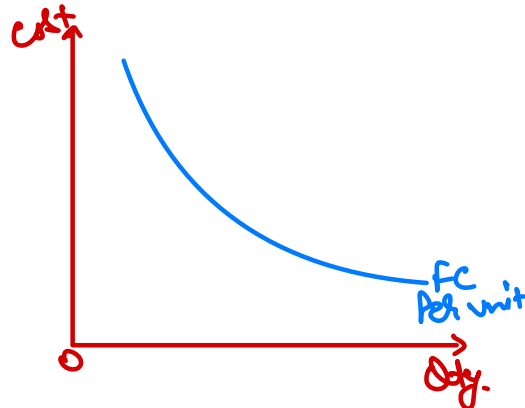
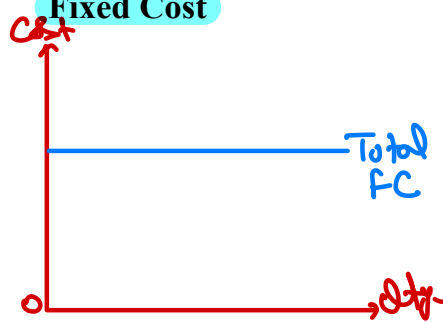
|                       | <u>60%</u> | <u>70%</u> | <u>80%</u> |
|-----------------------|------------|------------|------------|
| <i>Units</i>          | ✓          | ✓          | ✓          |
| <i>SP Per unit</i>    | ✓          | ✓          | ✓          |
| <i>Sales (A)</i>      | ✓          | ✓          | ✓          |
| <i>VC</i> =           |            |            |            |
| <i>VC (B)</i>         |            |            |            |
| <i>FC</i> =           |            |            |            |
| <i>FC (C)</i>         |            |            |            |
| <i>SVC</i> =          |            |            |            |
| <i>SVC (D)</i>        |            |            |            |
| <i>TC (B+C+D = E)</i> |            |            |            |
| <i>Pft. (A - E)</i>   | ✓          | ✓          | ✓          |

## 2. Type of Costs

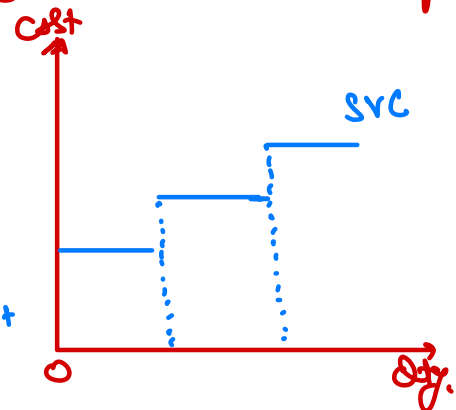
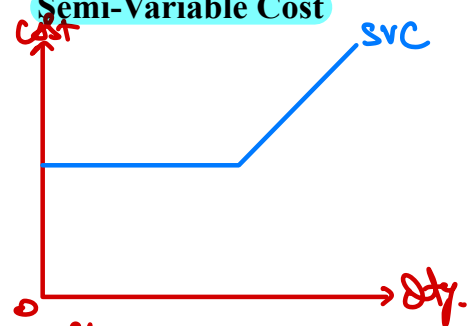
### Variable Cost



### Fixed Cost



### Semi-Variable Cost



3. Total Cost =  $\underbrace{\text{No. of units}}_{\substack{\downarrow \\ \text{Quantity} \\ \text{Effect}}} \times \underbrace{\text{Cost per unit}}_{\substack{\downarrow \\ \text{Price} \\ \text{Effect}}}$

## 4. Quantity & Price Effect

|                 | Total Variable Cost | Total Fixed Cost |
|-----------------|---------------------|------------------|
| Quantity Effect | Yes                 | No               |
| Price Effect    | Yes                 | Yes              |

## 5. Points to Remember (PTRs)

**A)** Unless otherwise provided, following assumptions are to be taken:-

- VC per unit will remain same
- Total Fixed cost will remain same
- All direct cost are assumed to be variable
- All overheads are assumed to be fixed

**B)**  $\text{Wages} \propto \frac{1}{\text{Efficiency}}$  and  $\text{Efficiency} \propto \text{Output}$

## 6. Distribution of Semi-Variable Cost if given at two or more levels

Variable cost per unit out of SVC =  $\frac{\text{Difference in cost}}{\text{Difference in units}} = \frac{SVC_1 - SVC_2}{U_1 - U_2}$

Fixed cost out of SVC = Total cost - Total variable cost  
(Do at only 1 level)

## 7. Sales, Production, Consumption and purchase budget

| Sales Budget |          |         |          |
|--------------|----------|---------|----------|
| Product      | Qty.     | SP P.v. | Sales    |
| A            | ✓        | ✓       | ✓        |
| B            | ✓        | ✓       | ✓        |
| C            | ✓        | ✓       | ✓        |
|              | <u>✓</u> |         | <u>✓</u> |

Sales = op. St. + Production - Cl. Stock  
Production = Sales + Cl. Stock - op. St.

| Production Bud. |          |          |          |
|-----------------|----------|----------|----------|
| Prod.           | Pr. A    | Pr. B    | Pr. C    |
| Sales           | ✓        | ✓        | ✓        |
| (+) Cl. Stock   | ✓        | ✓        | ✓        |
| (-) op. Stock   | ✓        | ✓        | ✓        |
| Prod.           | <u>✓</u> | <u>✓</u> | <u>✓</u> |

| RM Consumption Bud. |            |               |          |
|---------------------|------------|---------------|----------|
| Product             | Prod. Qty. | RM Cons. P.v. | RM Cons. |
| A                   | ✓          | ✓             | ✓        |
| B                   | ✓          | ✓             | ✓        |
| C                   | ✓          | ✓             | ✓        |
|                     | <u>✓</u>   |               | <u>✓</u> |

RM Cons. = op. St. + RM Purch. - Cl. Stock  
RM Purch. = RM Cons. + Cl. St. - op. Stock

| RM Purchase Bud. |          |          |          |
|------------------|----------|----------|----------|
| Prod.            | April    | May      | June     |
| RM Cons.         | ✓        | ✓        | ✓        |
| (+) Cl. St.      | ✓        | ✓        | ✓        |
| (-) op. St.      | ✓        | ✓        | ✓        |
| RM Purch.        | <u>✓</u> | <u>✓</u> | <u>✓</u> |

## BUDGET & BUDGETARY CONTROL – QUESTIONS

### Question – 1

PJ Ltd. manufactures hockey sticks. It sells the products at ₹ 500 each and makes a profit of ₹ 125 on each stick. The Company is producing 5,000 stocks annually by using 50% of its machinery capacity. The cost of each stick is as under:

|                  |                       |                                          |
|------------------|-----------------------|------------------------------------------|
| Direct material  | → ₹ 150               |                                          |
| Direct wages     | → ₹ 50                |                                          |
| Work Overheads   | → ₹ 125 (50% fixed)   | $V = 62.5$<br>$F = 62.5 \times 5000 = V$ |
| Selling Expenses | → ₹ 50 (25% variable) | $V = 12.5$<br>$F = 37.5 \times 5000 = V$ |

The anticipation for the next year is that cost will go up as under:

|                 |       |         |
|-----------------|-------|---------|
| Fixed charges   | → 10% | } Price |
| Direct wages    | → 20% |         |
| Direct material | → 5%  |         |

There will not be any change in selling price. There is an additional order for 2,000 sticks in the next year. Calculate the lowest price that can be quoted so that the Company can earn the same profit as it earned in the current year?

### Solution

#### Statement of calculation of selling price

| Particulars                                                         | Amount (₹)  |
|---------------------------------------------------------------------|-------------|
| Direct Material $[(150 + 5\%) \times 7,000]$                        | 11,02,500   |
| Direct Wages $[(50 + 20\%) \times 7,000]$                           | 4,20,000    |
| Variable Works Overhead $[125 \times 50\% \times 7,000]$            | 4,37,500    |
| Fixed Works Overhead $[125 \times 50\% \times 5,000 \times 110\%]$  | 3,43,750    |
| Variable Selling Expenses $[50 \times 25\% \times 7,000]$           | 87,500      |
| Fixed Selling Expenses $[50 \times 75\% \times 5,000 \times 110\%]$ | 2,06,250    |
| Total Cost                                                          | 25,97,500   |
| Add: Desired Profit $(125 \times 7,000)$                            | 8,75,000    |
| Total Sales Value                                                   | → 34,72,500 |
| Less: Existing Sales from 5,000 units $[5,000 \times 500]$          | → 25,00,000 |
| Sales value to be obtained from remaining 2,000 units (A)           | → 9,72,500  |
| Sale units (B)                                                      | → 2,000     |
| Selling price per unit $(A \div B)$                                 | 486.25      |

## Question – 2

SK Limited has prepared its expense budget for 50,000 units in its factory for the year 2021-22 as detailed below:

|                                      | ₹ per unit |
|--------------------------------------|------------|
| Direct materials → ✓                 | 125 ✓      |
| Direct labour → ✓                    | 50         |
| Variable overhead → ✓                | 40         |
| Direct expenses → ✓                  | 15         |
| Selling expenses (20% fixed)         | 25 ✓       |
| Factory expenses (100% fixed)        | 15         |
| Administration expenses (100% fixed) | 8          |
| Distribution expenses (85% variable) | 20         |
| Total →                              | 298        |

Prepare an expense budget for the production of 35,000 units and 70,000 units.

## Solution

### Expenses Budget

| Particulars                      | 35,000 units                              | 70,000 units                               |
|----------------------------------|-------------------------------------------|--------------------------------------------|
| Direct material                  | $35,000 \times 125 = 43,75,000$           | $70,000 \times 125 = 87,50,000$            |
| Direct labour                    | $35,000 \times 50 = 17,50,000$            | $70,000 \times 50 = 35,00,000$             |
| Variable overheads               | $35,000 \times 40 = 14,00,000$            | $70,000 \times 40 = 28,00,000$             |
| Direct expenses                  | $35,000 \times 15 = 5,25,000$             | $70,000 \times 15 = 10,50,000$             |
| Selling expenses – variable      | $35,000 \times 25 \times 80\% = 7,00,000$ | $70,000 \times 25 \times 80\% = 14,00,000$ |
| Selling expenses – fixed         | $50,000 \times 25 \times 20\% = 2,50,000$ | $50,000 \times 25 \times 20\% = 2,50,000$  |
| Factory expenses – fixed         | $50,000 \times 15 = 7,50,000$             | $50,000 \times 15 = 7,50,000$              |
| Administration expenses – fixed  | $50,000 \times 8 = 4,00,000$              | $50,000 \times 8 = 4,00,000$               |
| Distribution expenses – variable | $35,000 \times 20 \times 85\% = 5,95,000$ | $70,000 \times 20 \times 85\% = 11,90,000$ |
| Distribution expenses – fixed    | $50,000 \times 20 \times 15\% = 1,50,000$ | $50,000 \times 20 \times 15\% = 1,50,000$  |
| Total                            | 1,08,95,000                               | 2,02,40,000                                |

## Question – 3

SK Ltd. company, requires you to prepare the master budget for the next year from the following information:

### Sales:

Acrylic finish wooden sheets

→ ₹ 70,00,000

Lacquer finish wooden sheets

→ ₹ 30,00,000

Direct material cost (✓)

→ 65% of sales ✓

Direct wages (✓)

25 workers @ ₹ 1,500 per month

### Factory overheads:

Indirect labour-

Work manager (A)

→ ₹ 5,500 per month ✓

Foreman (F)

→ ₹ 4,500 per month ✓

Stores and spares (✓)

→ 2.5% on sales ✓

Depreciation on machinery

→ ₹ 1,26,000 ✓

Light and power (fixed)

→ ₹ 30,000 ✓

Repairs and maintenance

→ ₹ 80,000

Other sundries

10% on direct wages

Administration, selling and distribution expenses

→ ₹ 3,99,000 p.a.

### Solution

#### Master Budget for the year ending

| Particulars                                     | (₹)      | (₹)       | (₹)         |
|-------------------------------------------------|----------|-----------|-------------|
| Sales:                                          |          |           |             |
| Acrylic finish wooden sheets                    |          |           | 70,00,000   |
| Lacquer finish wooden sheets                    |          |           | 30,00,000   |
| Total Sales                                     |          |           | 1,00,00,000 |
| Less: Cost of production:                       |          |           |             |
| Direct materials (65% of ₹ 1,00,00,000)         |          | 65,00,000 |             |
| Direct wages (25 workers × ₹ 1,500 × 12 months) |          | 4,50,000  |             |
| Prime Cost                                      |          | 69,50,000 |             |
| Fixed Factory Overhead:                         |          |           |             |
| Works manager's salary (5,500 × 12 months)      | 66,000   |           |             |
| Foreman's salary (4,500 × 12 months)            | 54,000   |           |             |
| Depreciation                                    | 1,26,000 |           |             |
| Light and power                                 | 30,000   | 2,76,000  |             |
| Variable Factory Overhead:                      |          |           |             |
| Stores and spares (2.5% of ₹ 1,00,00,000)       | 2,50,000 |           |             |
| Repairs and maintenance                         | 80,000   |           |             |
| Sundry expenses                                 | 45,000   | 3,75,000  |             |
| Works Cost                                      |          |           | 76,01,000   |
| Gross Profit (Sales – Works cost)               |          |           | 23,99,000   |

|                                                      |  |  |             |
|------------------------------------------------------|--|--|-------------|
| Less: <u>Adm., selling and distribution expenses</u> |  |  | 3,99,000 ✓  |
| Net Profit                                           |  |  | 20,00,000 ✓ |

#### Question – 4

The Accountant of KPMR Ltd. has prepared the following budget for the coming year 2022 for its two products 'AYE' and 'ZYE':

| Particulars                       | Product 'AYE' | Product 'ZYE' |
|-----------------------------------|---------------|---------------|
| Production and Sales (in Units) → | 4,000         | 3,000         |
|                                   | Amount (in ₹) | Amount (in ₹) |
| Selling price per unit            | 200 ✓         | 180           |
| Direct material per unit ✓        | 80 ✓          | 70            |
| Direct labour per unit ✓          | 40 ✓          | 35            |
| Variable overhead per unit        | 20 ✓          | 25            |
| Fixed overhead per unit           | 10 ✓          | 10            |

After reviewing the above budget, the management has called the marketing team for suggesting some measures for increasing the sales. The marketing team has suggested that by promoting the products on social media, the sales quantity of both the products can be increased by 5%. Also, the selling price per unit will go up by 10%. But this will result in increase in expenditure on variable overhead and fixed overhead by 20% and 5% respectively for both the products.

You are required to prepare flexible budget for both the products:

- Before promotion on social media
- After promotion on social media

#### Solution

##### (i) Flexible Budget (Before promotion)

| Particulars           | Product AYE                   | Product ZYE                   | Total     |
|-----------------------|-------------------------------|-------------------------------|-----------|
| Sales                 | $4,000 \times 200 = 8,00,000$ | $3,000 \times 180 = 5,40,000$ | 13,40,000 |
| Less: Direct Material | $4,000 \times 80 = 2,40,000$  | $3,000 \times 70 = 2,10,000$  | 4,50,000  |
| Less: Direct labour   | $4,000 \times 40 = 1,60,000$  | $3,000 \times 35 = 1,05,000$  | 2,65,000  |
| Less: Variable OHs    | $4,000 \times 20 = 80,000$    | $3,000 \times 25 = 75,000$    | 1,55,000  |
| Less: Fixed OHs       | $4,000 \times 10 = 40,000$    | $3,000 \times 10 = 30,000$    | 70,000    |
| Profit                | 2,80,000                      | 1,20,000                      | 4,00,000  |

##### (ii) Flexible Budget (After promotion)

| Particulars           | Product AYE                   | Product ZYE                   | Total     |
|-----------------------|-------------------------------|-------------------------------|-----------|
| Sales                 | $4,200 \times 220 = 9,24,000$ | $3,150 \times 198 = 6,23,700$ | 15,47,700 |
| Less: Direct Material | $4,200 \times 80 = 3,36,000$  | $3,150 \times 70 = 2,20,500$  | 5,56,500  |
| Less: Direct labour   | $4,200 \times 40 = 1,68,000$  | $3,150 \times 35 = 1,05,000$  | 2,73,000  |
| Less: Variable OHs    | $4,200 \times 24 = 1,00,800$  | $3,150 \times 30 = 94,500$    | 1,95,300  |

94,500

1,95,300

|                 |                         |                         |                     |
|-----------------|-------------------------|-------------------------|---------------------|
| Less: Fixed OHs | $40,000 + 5\% = 42,000$ | $30,000 + 5\% = 31,500$ | 73,500              |
| Profit          | 2,77,200                | <del>1,56,450</del>     | <del>4,33,650</del> |

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### Question – 5

PSV Ltd. manufactures and sells a single product and estimated the following related information for the period November, 2020 to March, 2021.

| Particulars                                | November, 2020 | December, 2020 | January, 2021 | February, 2021 | March, 2021 |
|--------------------------------------------|----------------|----------------|---------------|----------------|-------------|
| Opening Stock of Finished goods (in Units) | 7,500          | 3,000          | 9,000         | 8,000          | 6,000       |
| Sales (in Units)                           | 30,000         | 35,000         | 38,000        | 25,000         | 40,000      |
| Selling Price per unit (in ₹)              | 10             | 12             | 15            | 15             | 20          |

#### Additional information:

- ☐ Closing stock of finished goods at the end of march, 2021 is 10,000 units
- ☐ Each unit of finished output requires 2kg of Raw Material 'A' and 3kg of Raw Material 'B'.

You are required to prepare the following budgets for the period November, 2020 to March 2021 on monthly basis:

- (i) Sales budget (in ₹)
- (ii) Production Budget (in units)
- (iii) Raw material budget for raw material 'A' and 'B' separately (in units)

### Solution

#### (i) Sales Budget

| Particulars                   | November, 2020 | December, 2020 | January, 2021 | February, 2021 | March, 2021 |
|-------------------------------|----------------|----------------|---------------|----------------|-------------|
| Sales (in Units)              | 30,000         | 35,000         | 38,000        | 25,000         | 40,000      |
| Selling Price per unit (in ₹) | 10             | 12             | 15            | 15             | 20          |
| Sales Value                   | 3,00,000       | 4,20,000       | 5,70,000      | 3,75,000       | 8,00,000    |

#### (ii) Production Budget

| Particulars               | November, 2020 | December, 2020 | January, 2021 | February, 2021 | March, 2021 |
|---------------------------|----------------|----------------|---------------|----------------|-------------|
| Sales Units               | 30,000         | 35,000         | 38,000        | 25,000         | 40,000      |
| Add: Closing Stock Units  | 3,000          | 9,000          | 8,000         | 6,000          | 10,000      |
| Less: Opening Stock Units | (7,500)        | (3,000)        | (9,000)       | (8,000)        | (6,000)     |
| Production Units          | 25,500         | 41,000         | 37,000        | 23,000         | 44,000      |

(iii)

**Raw Material 'A' Budget**

| Particulars                         | November, 2020 | December, 2020 | January, 2021 | February, 2021 | March, 2021 |
|-------------------------------------|----------------|----------------|---------------|----------------|-------------|
| Production Units →                  | 25,500         | 41,000         | 37,000        | 23,000         | 44,000      |
| Raw material consumption per unit → | 2              | 2              | 2             | 2              | 2           |
| Raw Material Consumption →          | 51,000         | 82,000         | 74,000        | 46,000         | 88,000      |

**Raw Material 'B' Budget**

| Particulars                         | November, 2020 | December, 2020 | January, 2021 | February, 2021 | March, 2021 |
|-------------------------------------|----------------|----------------|---------------|----------------|-------------|
| Production Units                    | 25,500         | 41,000         | 37,000        | 23,000         | 44,000      |
| Raw material consumption per unit → | 3              | 3              | 3             | 3              | 3           |
| Raw Material Consumption            | 76,500         | 1,23,000       | 1,11,000      | 69,000         | 1,32,000    |

**Question – 6**

AB manufacturing Company manufactures two products A and B. Both Products use a common Raw Material 'C'. The Raw Material 'C' is purchased at the rate of ₹ 45 per kg from the Market. The Company has made estimates for the year ended 31<sup>st</sup> March, 2018 (the budget period) as under:

|                                                      | Product A | Product B        |
|------------------------------------------------------|-----------|------------------|
| Sales in Units                                       | → 36,000  | 16,700           |
| Finished goods stock increase by year-end (in Units) | → 860     | → 400 [CD - Op.] |
| Post-production Rejection Rate (%)                   | → 3%      | 5%               |
| Material 'C' per completed Unit, net of wastage      | → 4 kg ✓  | 5 kg ✓           |
| Material 'C' wastage in %                            | → 5       | 4                |

Additional information available is as under:

- ☐ Usage of Raw Material 'C' is expected to be at a constant rate over the period.
- ☐ Annual cost of holding one unit of Raw Material 'C' in Stock is 9% of the Material Cost.
- ☐ The cost of placing an order is ₹ 250 per order.

You are required to:

- (i) Prepare Functional Budgets for the year ended 31<sup>st</sup> March, 2018 under the following categories:
  - a) Production Budget for Products A and B in Units
  - b) Purchase Budget for Raw Material 'C' in kg and value.
- (ii) Calculate the Economic Order Quantity (EOQ) in kg for Raw Material 'C'.

### Solution

#### (i) Production Budget (in units) for the year ended 31<sup>st</sup> March 2018

| Particulars                      | Product A                   | Product B                   |
|----------------------------------|-----------------------------|-----------------------------|
| Budgeted sales (units)           | 36,000                      | 16,700                      |
| Add: Increase in closing stock   | 860                         | 400                         |
| No. of good units to be produced | 36,860                      | 17,100                      |
| Post production rejection rate   | 3%                          | 5%                          |
| Post production good units rate  | 100% - 3% = 97%             | 100% - 5% = 95%             |
| No. of units to be produced      | $36,860 \div 97\% = 38,000$ | $17,100 \div 95\% = 18,000$ |

→ Good units

#### (ii) Purchase budget (in kgs and value) for Material C

| Particulars                                | Product A                        | Product B                      |
|--------------------------------------------|----------------------------------|--------------------------------|
| No. of units to be produced                | 38,000                           | 18,000                         |
| Usage of Material C per unit of production | → 4 kg                           | → 5 kg                         |
| Material needed for production             | 1,52,000 kg                      | 90,000 kg                      |
| Wastage % of Material C                    | → 5%                             | → 4%                           |
| Good usage % of Material C                 | 100% - 5% = 95%                  | 100% - 4% = 96%                |
| Material to be purchased (in kg)           | $1,52,000 \div 95\% = 1,60,000$  | $90,000 \div 96\% = 93,750$    |
| Rate per kg of Material C                  | → ₹ 45                           | → ₹ 45                         |
| Total Purchase cost                        | $1,60,000 \times 45 = 72,00,000$ | $93,750 \times 45 = 42,18,750$ |

Total purchase cost = 72,00,000 + 42,18,750 = ₹ 1,14,18,750

(iii)  $A = 1,60,000 + 93,750 = 2,53,750$  kg ✓

O = ₹ 250 ✓

C = ₹ 45 × 9% = ₹ 4.05 ✓

$$EOQ = \sqrt{\frac{2 \times A \times O}{C}} = \sqrt{\frac{2 \times 2,53,750 \times 250}{4.05}} = 5,597 \text{ kg} \checkmark$$

### Question – 7

SK Ltd. manufactures and sells a single product and has estimated sales revenue of ₹ 302.40 lakh during the year based on 20% profit on selling price. Each unit of product requires 6 kg of material A and 3 kg of material B and processing time of 4 hours in machine shop and 2 hours in assembly shop. Factory overheads are absorbed at a blanket rate of 20% of direct labour. Variable selling & distribution overheads are ₹ 60 per unit sold and fixed selling & distribution overheads are estimated to be ₹ 69,12,000.

The other relevant details are as under:

|                 |               |                  |
|-----------------|---------------|------------------|
| Purchase Price: | Material A    | → ₹ 160 per kg   |
|                 | Material B    | → ₹ 100 per kg   |
| Labour Rate:    | Machine shop  | → ₹ 140 per hour |
|                 | Assembly Shop | → ₹ 70 per hour  |

|                 | Finished Stock | Material A ✓ | Material B ✓ |
|-----------------|----------------|--------------|--------------|
| Opening Stock → | 2,500 units ✓  | 7,500 kg     | 4,000 kg     |
| Closing Stock → | 3,000 units ✓  | 8,000 kg     | 5,500 kg     |

Required:

- Calculate number of units of product proposed to be sold and selling price per unit
- Prepare production budget in units
- Prepare material purchase budget in units

### Solution

**Working Note:**

**Statement showing Total Variable Cost**

| Particulars                                      | Amount (₹)                       |
|--------------------------------------------------|----------------------------------|
| Estimated sales Revenue →                        | 3,02,40,000                      |
| Less: Desired Profit margin on sales @ 20% →     | 60,48,000                        |
| Total cost →                                     | 2,41,92,000                      |
| Less: fixed selling and distribution overheads → | <del>2,41,92,000</del> 69,12,000 |
| Total Variable cost →                            | 1,72,80,000 ✓                    |

**Statement showing variable cost per unit**

| Particulars                                 | Amount (₹) |
|---------------------------------------------|------------|
| Direct materials:                           |            |
| A: <u>6kg</u> × ₹ <u>160</u>                | → 960      |
| B: <u>3kg</u> × ₹ <u>100</u>                | → 300      |
| Labour cost                                 |            |
| Machine shop: <u>4 hours</u> × ₹ <u>140</u> | → 560      |
| Assembly shop: <u>2 hours</u> × ₹ <u>70</u> | → 140      |
| Factory overheads: [20% × (560 + 140)]      | 140        |
| Variable selling and distribution expenses  | 60         |
| Total variable cost per unit                | 2,160 ✓    |

$$(i) \text{ Number of units sold} = \frac{\text{Total Variable Cost}}{\text{Variable Cost per unit}} = \frac{1,72,80,000}{2,160} = \underline{8,000 \text{ units}}$$

$$\text{Selling price per unit} = \frac{\text{Sales}}{\text{Number of units}} = \frac{3,02,40,000}{8,000} = \underline{\underline{₹ 3,780}}$$

(ii) **Production Budget (units)**

| Particulars         | Units   |
|---------------------|---------|
| Budgeted Sales      | 8,000   |
| Add: closing stock  | 3,000   |
| Less: opening stock | (2,500) |
| Required Production | 8,500   |

(iii) **Materials Purchase Budget (Kg)**

| Particulars                | Material A                         | Material B                         |
|----------------------------|------------------------------------|------------------------------------|
| Requirement for production | $8,500 \times 6\text{kg} = 51,000$ | $8,500 \times 3\text{kg} = 25,500$ |
| Add: Desired closing Stock | 8,000                              | 5,500                              |
| Less: Opening Stock        | (7,500)                            | (4,000)                            |
| Quantity to be purchased   | 51,500                             | 27,000                             |

**Question – 8**

An electronic gadget manufacturer has prepared sales budget for the next few months. In this respect, following figures are available:

| Month    | Electronic gadgets' sales |
|----------|---------------------------|
| January  | 5,000 units               |
| February | 5,000 units               |
| March    | 7,000 units               |
| April    | 7,500 units               |
| May      | 8,000 units               |

To manufacture an electronic gadget, a standard cost of ₹ 1,500 is incurred and it is sold through dealers at an uniform price of ₹ 2,000 per gadget to customers. Dealers are given a discount of 15% on selling price.

Apart from other materials, two units of batteries are required to manufacture a gadget. The company wants to hold stock of batteries at the end of each month to cover 30% of next month's production and to hold stock of manufactured gadgets to cover 25% of the next month's sale. 3,250 units of batteries and 1,200 units of manufactured gadgets were in stock on 1<sup>st</sup> January.

Required:

- Prepare production budget (in units) for the month of January, February, March and April
- Prepare purchase budget for batteries (in units) for the month of January, February and March and calculate profit for the quarter ending on March.

## Solution

### (i) Production Budget

| Particulars           | January      | February     | March        | April        |
|-----------------------|--------------|--------------|--------------|--------------|
| Budgeted Sales →      | 5,000        | 6,000        | 7,000        | 7,500        |
| Add: Closing Stock →  | 1,500        | 1,750        | 1,875        | 2,000        |
| Less: Opening Stock → | (1,200)      | (1,500)      | (1,750)      | (1,875)      |
| <b>Production</b>     | <b>5,300</b> | <b>6,250</b> | <b>7,125</b> | <b>7,625</b> |

#### Working Notes:

- Closing stock of January =  $25\% \times 6,000 = 1,500$   
 Closing stock of February =  $25\% \times 7,000 = 1,750$   
 Closing stock of March =  $25\% \times 7,500 = 1,875$   
 Closing stock of April =  $25\% \times 8,000 = 2,000$
- Opening stock of February, March and April are taken as equal to closing stock of respective previous month.

### (ii) Material Purchase Budget

| Particulars                               | Material A    |               |               |
|-------------------------------------------|---------------|---------------|---------------|
|                                           | January       | February      | March         |
| Raw material consumption @ 2 per gadget → | 10,600        | 12,500        | 14,250        |
| Add: Closing Stock →                      | 3,750         | 4,275         | 4,575         |
| Less: Opening Stock →                     | (3,250)       | (3,750)       | (4,275)       |
| <b>Raw Material Purchase</b>              | <b>53,500</b> | <b>53,000</b> | <b>44,000</b> |

#### Working Notes:

- Closing stock of material of January =  $30\% \times 12,500 = 3,750$   
 Closing stock of material of February =  $30\% \times 14,250 = 4,275$
- Raw Material consumption of Material for Month of April =  $7,625 \times 2 = 15,250$   
 Closing stock of material of March of Material =  $30\% \times 15,250 = 4,575$
- Opening stock for material for month of February and March are taken as equal to closing stock of respective previous month.

### Statement Showing Profit

| Particulars                            | January     | February    | March       | Total       |
|----------------------------------------|-------------|-------------|-------------|-------------|
| Sales (A) (units) →                    | 5,000       | 6,000       | 7,000       | 18,000      |
| Selling price per unit →               | ₹ 2,000     | ₹ 2,000     | ₹ 2,000     | ₹ 2,000     |
| Less: Discount @15% of selling price → | ₹ 300       | ₹ 300       | ₹ 300       | ₹ 300       |
| Less: Standard cost of manufacturing → | ₹ 1,500     | ₹ 1,500     | ₹ 1,500     | ₹ 1,500     |
| Profit (B) →                           | ₹ 200       | ₹ 200       | ₹ 200       | ₹ 200       |
| Total Profit (A × B) →                 | ₹ 10,00,000 | ₹ 12,00,000 | ₹ 14,00,000 | ₹ 36,00,000 |

### Question – 9

SK Ltd. Produces and sells a single product. Sales budget for the calendar year 2019 by quarter is as under:

| Quarter | No. of units to be sold |
|---------|-------------------------|
| I       | 12,000                  |
| II      | 15,000                  |
| III     | 16,500                  |
| IV      | 18,000                  |

The year is expected to open with an inventory of 4,000 units of finished product and close with an inventory of 6,500 units.

Production is customarily scheduled to provide for two-thirds of the current quarter's sales demand plus one third of the following quarter's demand. Thus, production anticipates sales volume by about one month.

The standard cost details for one unit of the product is as follows:

Direct materials 10 lbs. @ 50 paise per lb.

Direct labour 1 hour 30 minutes @ ₹ 4 per hour.

Variable overheads 1 hour 30 minutes @ ₹ 1 per hour.

Fixed overheads 1 hour 30 minutes @ ₹ 2 per hour based on a budgeted volume of 90,000 direct labour hour for the year.

- Prepare a production budget for 2019, by quarters, showing the number of units to be produced, and the total costs of direct labour, variable overheads and fixed overheads.
- If the budgeted selling price per unit is ₹ 17, what would be the budgeted profit for the year as a whole?
- In which quarter of the year is the company expected to breakeven?

### Solution

#### (i) Production Budget

| Particulars          | Quarter - 1   | Quarter - 2   | Quarter - 3   | Quarter - 4   | Total         |
|----------------------|---------------|---------------|---------------|---------------|---------------|
| Sales units          | 12,000        | 15,000        | 16,500        | 18,000        | 61,500        |
| <b>Production</b>    |               |               |               |               |               |
| 2/3 of current month | 8,000         | 10,000        | 11,000        | 12,000        | 41,000        |
| 1/3 of next month    | 5,000         | 5,500         | 6,000         | 6,500*        | 23,000        |
| <b>Production</b>    | <b>13,000</b> | <b>15,500</b> | <b>17,000</b> | <b>18,500</b> | <b>64,000</b> |

\*This value of 6,500 units is computed as balancing figure.

### Working Note -

Annual total production = Sales + closing stock – Opening stock = 61,500 + 6,500 – 4,000 = 64,000

Production for Quarter - 4 = Total production – production of first three quarters  
= 64,000 – 13,000 – 15,500 – 17,000 = 18,500

### Statement of Cost

| Particulars                                 | Quarter - 1 | Quarter - 2 | Quarter - 3 | Quarter - 4 | Total                    |
|---------------------------------------------|-------------|-------------|-------------|-------------|--------------------------|
| Production units                            | 13,000      | 15,500      | 17,000      | 18,500      | 64,000                   |
| Direct material ( $10 \times 0.5 = 5$ p.u.) | 65,000      | 77,500      | 85,000      | 92,500      | 3,20,000                 |
| Direct labour ( $1.5 \times 4 = 6$ p.u.)    | 78,000      | 93,000      | 1,02,000    | 1,11,000    | 3,84,000                 |
| Variable Ohs ( $1.5 \times 1 = 1.5$ p.u.)   | 19,500      | 23,250      | 25,500      | 27,750      | 96,000                   |
| Fixed overheads                             | 45,000      | 45,000      | 45,000      | 45,000      | 1,80,000<br>(90,000 × 2) |

### (ii) Statement of profit

| Particulars                                                                                      | Amount    |
|--------------------------------------------------------------------------------------------------|-----------|
| Sales ( $17 \times 61,500$ )                                                                     | 10,45,500 |
| Less: Variable cost $\left[ \frac{(3,20,000 + 3,84,000 + 96,000)}{64,000} \times 61,500 \right]$ | 7,68,750  |
| <b>Contribution</b>                                                                              | 2,76,750  |
| Less: Fixed costs                                                                                | 1,80,000  |
| <b>Profit</b>                                                                                    | 96,750    |

(iii) Breakeven point =  $\frac{\text{Fixed Cost}}{\text{Contribution per unit}} = \frac{1,80,000}{\left( \frac{2,76,750}{61,500} \right)} = 40,000 \text{ units}$

| Particulars            | Quarter - 1 | Quarter - 2 | Quarter - 3 | Quarter - 4 |
|------------------------|-------------|-------------|-------------|-------------|
| Sales units            | 12,000      | 15,000      | 16,500      | 18,000      |
| Cumulative Sales units | 12,000      | 27,000      | 43,500      | 61,500      |

∴ Breakeven will be achieved in quarter 3.

### Question – 10

SR Ltd. is a manufacturer of Garments. For the first three months of financial year 2022-23 commencing on 1<sup>st</sup> April, 2022, production will be constrained by direct labour. It is estimated that only 12,000 hours of direct labour hours will be available in each month.

For market reasons, production of either of the two garments must be at least 25% of the production of the other. Estimated cost and revenue per garment are as follows:

|                            | Shirt (₹) | Short (₹) |
|----------------------------|-----------|-----------|
| Sales price                | 60        | 44        |
| Raw materials              |           |           |
| Fabric @12 per metre       | 24        | 12        |
| Dyes and cotton            | 6         | 4         |
| Direct labour @8 per hour  | 8         | 4         |
| Fixed Overhead @4 per hour | 4         | 2         |
| Profit                     | 18        | 22        |

From the month of July 2022 direct labour will no longer be a constraint. The company expects to be able to sell 15,000 shirts and 20,000 shorts in July 2022. There will be no opening stock at the beginning of July 2022.

Sales volumes are expected to grow at 10% per month cumulatively thereafter throughout the year. Following additional information is available:

- The company intends to carry stock of finished garments sufficient to meet 40% of the next month's sale from July 2022 onwards.
- The estimated selling price will be same as above.

Required:

- (i) Calculate the number of shirts and shorts to be produced per month in the first quarter of financial year 2022-23 to maximize company's profit.
- (ii) Prepare the following budgets on a monthly basis for July, August and September 2022:
  - (a) Sales budget showing sales units and sales revenue for each product.
  - (b) Production budget (in units) for each product.

### Solution

#### (i) Statement of contribution per unit

| Particulars                       | Shirt (₹)           | Short (₹)             |
|-----------------------------------|---------------------|-----------------------|
| Selling price per unit (A)        | 60                  | 44                    |
| Fabric cost per unit              | 24                  | 12                    |
| Dyes & Cotton per unit            | 6                   | 4                     |
| Direct labour per unit            | 8                   | 4                     |
| Variable cost per unit (B)        | 38                  | 20                    |
| Contribution per unit (A – B = C) | 22                  | 24                    |
| Labour hours per unit             | $\frac{8}{8} = 1$   | $\frac{4}{8} = 0.5$   |
| Contribution per labour hour      | $\frac{22}{1} = 22$ | $\frac{24}{0.5} = 48$ |

Since contribution per labour hour is higher in case of short, thus it is advisable to produce it first.

Let number of shorts to be produced =  $y$

Labour hours required used to produce shorts =  $0.5y$

Labour hours available for shirts =  $12,000 - (0.5y)$

Number of shirts that can be produced =  $\frac{12,000 - 0.5y}{1} = 12,000 - 0.5y$

As per condition of 25% given in question,

Production of shirt = 25% of production of short

$$12,000 - 0.5y = 25\% \times y$$

$$12,000 - 0.5y = 0.25y$$

$$12,000 = 0.75y$$

$$y = 16,000$$

Thus, number of shorts to be produced =  $y = 16,000$

and, number of shirts to be produced =  $12,000 - 0.5(16,000) = 4,000$

(ii) (a) Sales budget

| Particulars     | Shirt    |          |           | Short    |          |           |
|-----------------|----------|----------|-----------|----------|----------|-----------|
|                 | July     | August   | September | July     | August   | September |
| Sale units →    | 15,000   | 16,500   | 18,150    | 20,000   | 22,000   | 24,200    |
| S.P. per unit → | 60       | 60       | 60        | 44       | 44       | 44        |
| Total Sales →   | 9,00,000 | 9,90,000 | 10,89,000 | 8,80,000 | 9,68,000 | 10,64,800 |

(ii) (b) Production Budget

| Particulars                                   | Shirt  |         |           | Short  |         |           |
|-----------------------------------------------|--------|---------|-----------|--------|---------|-----------|
|                                               | July   | August  | September | July   | August  | September |
| Sale units →                                  | 15,000 | 16,500  | 18,150    | 20,000 | 22,000  | 24,200    |
| (+) Closing Stock<br>(40% of next month sale) | 6,600  | 7,260   | 7,986*    | 8,800  | 9,680   | 10,468*   |
| (-) Opening stock                             | -      | (6,600) | (7,260)   | -      | (8,800) | (9,680)   |
| Total Production                              | 21,600 | 17,160  | 18,876    | 28,800 | 22,880  | 24,988    |

\*Closing stock for September

Closing stock of shirts = Sales of October × 10% =  $(18,150 \times 110\%) \times 40\% = 7,986$

Closing stock of shorts = Sales of October × 10% =  $(24,200 \times 110\%) \times 40\% = 10,468$

# Budget & Budgetary Control

## MCQs

Q(1). If a company wishes to establish a factory overhead budget system in which estimated costs can be derived directly from estimates of activity levels, it should prepare a:

- ☒ A. Master budget
- ☐ B. Cash budget
- ☒ C. Flexible budget
- ☐ D. Fixed budget

Q(2). The classification of fixed and variable cost is useful for the preparation of:

- ☐ A. Master budget
- ☒ B. Flexible budget
- ☐ C. Cash budget
- ☐ D. Capital budget

Q(3). Budget manual is a document:

- ☐ A. Which contains different type of budgets to be formulated only
- ☐ B. Which contains the details about standard cost of the products to be made
- ☒ C. Setting out the budget organization and procedures for preparing a budget including fixation of responsibilities, formats and records required for the purpose of preparing a budget and for exercising budgetary control system.
- ☐ D. None of the above

Q(4). The budget control organization is usually headed by a top executive who is known as:

- ☐ A. General manager
- ☒ B. Budget director/ budget controller
- ☐ C. Accountant of the organization
- ☐ D. None of the above

Q(5). "A favourable budget variance is always an indication of efficient performance." Do you agree, give reason?

- ☐ A. A favourable variance indicates, saving on the part of the organization hence it indicates efficient performance of the organization.
- ☐ B. Under all situations, a favourable variance of an organization speaks about its efficient performance.
- ☒ C. A favourable variance does not necessarily indicate efficient performance, because such a variance might have been arrived at by not carrying out the expenses mentioned in the budget
- ☐ D. None of the above

Q(6). A budget report is prepared on the principle of exception and thus-

- ☐ A. Only favourable variances should be shown
- ☒ B. Only favourable variance should be shown
- ☒ C. Both favourable and unfavourable variances should be shown
- ☐ D. None of the above

Q(7). Purchase budget and materials budget are same:

- ☐ A. Purchase budget is a budget which includes only the details of all materials purchased
- ☒ B. Purchases budget is a wider concept and thus includes not only purchases of materials but also other items as well
- ☐ C. Purchases budget is different from materials budget; it includes purchases of other items only
- ☐ D. None of the above

Q(8). Efficiency ratio is:

- ☐ A. The extent of actual working days avoided during the budget period
- ☒ B. Activity ratio/ capacity ratio
- ☐ C. Whether the actual activity is more or less than budgeted activity
- ☐ D. None of the above

Q(9). Activity ratio depicts:

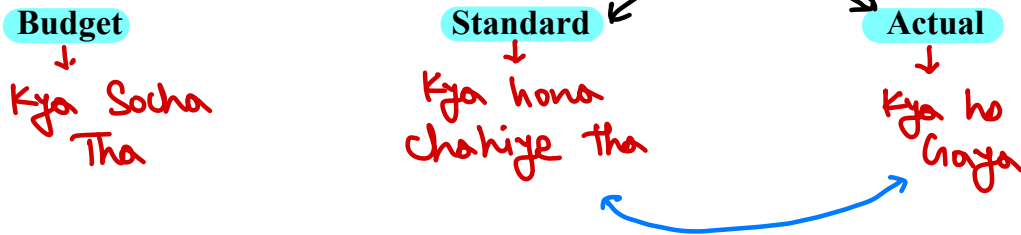
- ☐ A. Whether actual capacity utilized exceeds or falls short of the budgeted capacity
- ☐ B. Whether the actual hours used for actual production were more or less than the standard hours
- ☒ C. Whether actual activity was more or less than the budgeted capacity
- ☐ D. None of the above

Q(10). Which of the following is usually a short-term budget:

- ☒ A. Capital expenditure budget
- ☐ B. Research and development budget
- ☒ C. Cash budget
- ☐ D. Sales budget

# STANDARD COSTING - CONCEPTS

## 1. Basic Terms



## 2. Always calculate standard data on the basis of actual output

## 3. Variances

+ve, favourable ⇒ (F)  
-ve, Adverse ⇒ (A)

## 4. Material Variance

$$MCV = SC - AC$$

$$MPV = (SP - AP) \times AQ \text{ Purch.}$$

$$MOV = (SQ - AQ \text{ Consume}) \times SP$$

$$MMV = (RSQ - AQ) \times SP$$

$$MYV = (SQ - RSQ) \times SP$$

$$MYV = (AY - SY) \times \text{Std. Cost P.v. of output}$$

where.

- SC = Std. Cost
- AC = Actual Cost
- SP = Std. Price
- AP = Actual Price
- AQ = Actual Qty. ↙ Purch.  
↘ Consume
- SQ = Std. Qty.
- RSQ = Revised Std. Qty. = Actual Input in Std. Ratio
- AY = Actual Yield
- SY = Standard Yield =  $\frac{\text{Std. o/p}}{\text{Std. I/p}} \times \text{Actual I/p}$
- Std. Cost P.v. of o/p =  $\frac{\text{Total Std. Cost}}{\text{Total output}}$

**5. Material Cost Variance (MCV)**

$$\text{MCV} = \text{Standard cost} - \text{Actual Cost}$$

**6. Material Price Variance (MPV)**

$$\text{MPV} = (\text{SP} - \text{AP}) \times \text{Actual quantity}$$

**7. Material Usage Variance (MUV)**

$$\text{MUV} = (\text{SQ} - \text{AQ}) \times \text{SP}$$

**8. Material Mix Variance (MMV)**

$$\text{MMV} = (\text{RSQ} - \text{AQ}) \times \text{SP}$$

**9. Material Yield Variance (MYV)**

$$\text{MYV} = (\text{SQ} - \text{RSQ}) \times \text{SP}$$

$$\text{MYV} = (\text{AY} - \text{SY}) \times \text{Standard cost per unit of output}$$

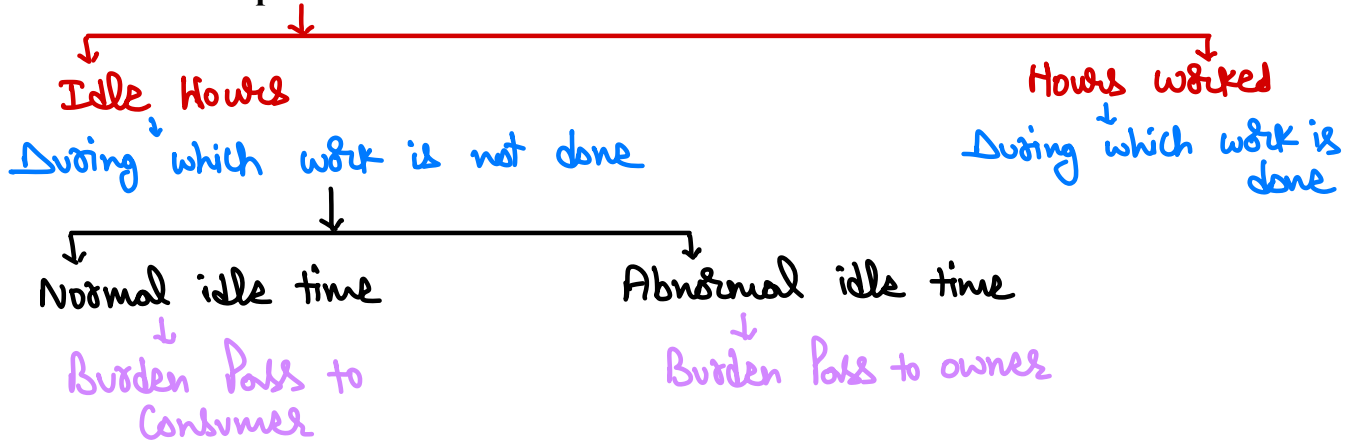
**10. Actual Quantity**



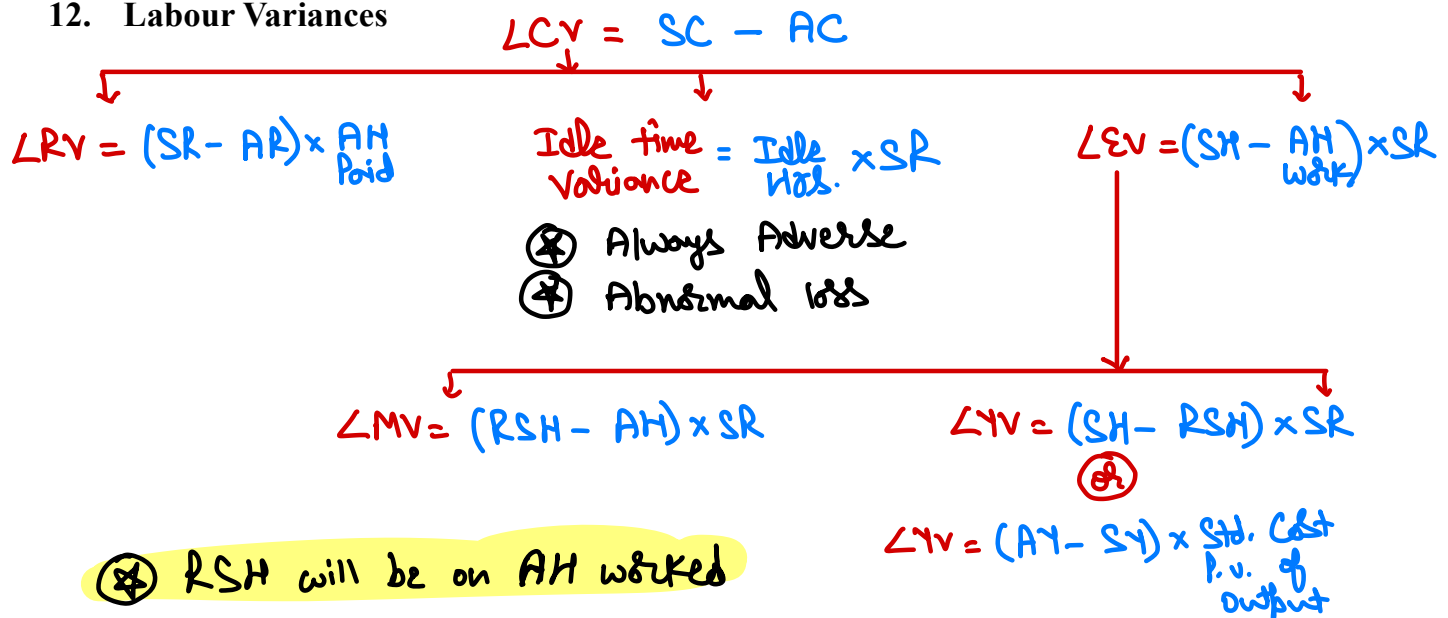
④ If op. Stock rate is not given then Consider it at Std. price

④ Unless otherwise provided, FIFO method is used

### 11. Total Hours paid



### 12. Labour Variances



### 13. Labour Cost Variance (LCV) ✓

$LCV = \text{Standard cost} - \text{Actual cost}$

### 14. Labour Rate Variance (LRV) ✓

$LRV = (SR - AR) \times \text{Actual hours paid}$

### 15. Labour Efficiency Variance (LEV) ✓

$LEV = (SH - \text{Actual hours worked}) \times SR$

### 16. Labour Idle Time Variance ✓

$\text{Idle time variance} = \text{Idle hours} \times SR$

⊗ Always Adverse  
⊗ Abnormal loss

17. Labour Mix Variance (LMV) ✓

$$\text{LMV} = (\text{RSH} - \text{AH worked}) \times \text{SR}$$

18. Labour Yield Variance (LYV) ✓

$$\text{LYV} = (\text{SH} - \text{RSH}) \times \text{SR}$$

$$\text{LYV} = (\text{AY} - \text{SY}) \times \text{Standard cost per unit of output}$$

19. Variable OHs Variance

$$\text{V. OH Cost Var.} = \text{Recovered OHs} - \text{Actual OHs}$$

V. OH Expd. Var.

$$= (\text{RR} - \text{AR}) \times \text{AH worked}$$

V. OH Efficiency Var.

$$= (\text{SH} - \text{AH work}) \times \text{RR}$$

⊛ Var. OHs are always on Hours worked

20. Variable OH Cost Variance (VOCV) ✓

$$\text{VOCV} = \text{Recovered OHs} - \text{Actual OHs}$$

21. Variable OH Expenditure Variance (VOEV) ✓

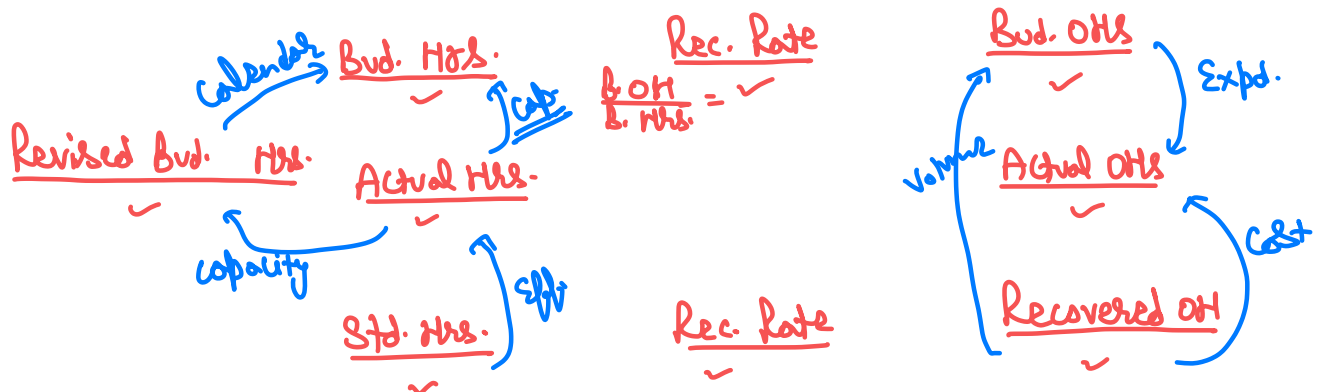
$$\text{VOEV} = (\text{Recover Rate} - \text{Actual Rate}) \times \text{Actual hours worked}$$

22. Variable OH Efficiency Variance (VOEFV) ✓

$$\text{VOEFV} = (\text{SH} - \text{Actual hours worked}) \times \text{Recovery Rate}$$

23. Fixed OHs Variance

- This is based on hours paid
- Fixed OHs are estimated in advance
- Based on estimated OHs, recovery rate is computed
- Based on Recovery rate, OHs are recovered
- Actual OHs are paid



24. **Fixed OH Cost Variance (FOCV)** ✓

$$\text{FOCV} = \text{Recovered OHs} - \text{Actual OHs}$$

25. **Fixed OH Expenditure Variance (FOEV)** ✓

$$\text{FOEV} = \text{Budgeted OHs} - \text{Actual OHs}$$

26. **Fixed OH Volume Variance (FOVV)** ✓

$$\text{FOVV} = \text{Recovered OHs} - \text{Budgeted OHs}$$

27. **Fixed OH Efficiency Variance (FOEFV)** ✓

$$\text{FOEFV} = (\text{Standard hours} - \text{Actual Hours}) \times \text{Recovery Rate}$$

28. **Fixed OH Capacity Variance (FOCPV)** ✓

$$\text{FOCPV} = (\text{Actual Hours} - \text{Revised budgeted hours}) \times \text{Recovery Rate}$$

29. **Fixed OH Calendar Variance (FOCLV)** ✓

$$\text{FOCLV} = (\text{Revised budgeted hours} - \text{Budgeted hours}) \times \text{Recovery Rate}$$

30. **Budget Ratios / Control Ratios**

$$\text{Efficiency Ratio} = \frac{\text{Standard hours}}{\text{Actual hours}} \times 100 \quad \checkmark$$

$$\text{Activity Ratio} = \frac{\text{Standard hours}}{\text{Budgeted hours}} \times 100$$

$$\text{Calendar Ratio} = \frac{\text{Actual working days}}{\text{Budgeted Working Days}} \times 100 = \frac{\text{Revised budgeted hours}}{\text{Budgeted hours}} \times 100$$

$$\text{Actual usage of Budgeted Capacity Ratio} = \frac{\text{Actual hours}}{\text{Budgeted hours}} \times 100 \quad \checkmark$$

$$\text{Standard Capacity Ratio} = \frac{\text{Budgeted hours}}{\text{Maximum possible hours in budget}} \times 100$$

$$\text{Actual Capacity Usage Ratio} = \frac{\text{Actual hours}}{\text{Maximum possible working hours}} \times 100$$

Eff. Ratio  $\times$  Cap. Ratio = Activity Ratio

# STANDARD COSTING – QUESTIONS

## Question – 1

The standard cost of a chemical mixture is as follows:

✓ 60% of Material A @ ₹ 50 per kg

✓ 40% of Material B @ ₹ 60 per kg

A standard loss of 25% on output is expected in production. The cost records for a period has shown the following usage.

✓ 540 kg of Material A @ ₹ 60 per kg

✓ 260 kg of Material B @ ₹ 50 per kg

The quantity processed was 680 kilograms of good product.

From the above given information, calculate:

- Material cost variance
- Material price variance
- Material usage variance
- Material mix variance
- Material yield variance

## Solution

### Basic Calculation

| Particulars   | Standard                     |      |          | Actual   |      |        | Revised Std. Quantity      |
|---------------|------------------------------|------|----------|----------|------|--------|----------------------------|
|               | Quantity                     | Rate | Amount   | Quantity | Rate | Amount |                            |
| Material A    | $850 \times 60\%$<br>= 510   | 50   | 25,500   | 540 ✓    | 60 ✓ | 32,400 | $800 \times 60\%$<br>= 480 |
| Material B    | $850 \times 40\%$<br>= 340   | 60   | 20,400   | 260 ✓    | 50 ✓ | 13,000 | $800 \times 40\%$<br>= 320 |
| (100) Input   | (850)                        |      | (45,900) | (800)    |      | 45,400 | 800                        |
| (25) (-) Loss | $680 \times 25\%$<br>= 170 ✓ |      |          | 120 ✓    |      |        |                            |
| (75) Output   | 680                          |      |          | (680)    |      |        |                            |

### Calculation of Variances

(i) Material Cost Variance = Standard Cost – Actual cost

$$\rightarrow A = 25,500 - 32,400 = ₹ 6,900 (A) ✓$$

$$\rightarrow B = 20,400 - 13,000 = ₹ 7,400 (F) ✓$$

$$MCV = ₹ 500 (F)$$

1. Material Price Variance = (SP – AP) × AQ ✓

$$A = (50 - 60) \times 540 = ₹ 5,400 (A) ✓$$

$$B = (60 - 50) \times 260 = ₹ 2,600 (F) ✓$$

$$MPV = ₹ 2,800 (A)$$

2. Material Usage (or Quantity) Variance =  $(SQ - AQ) \times SP$

$$A = (510 - 540) \times 50 = ₹ 1,500 (A) ✓$$

$$B = (340 - 260) \times 60 = ₹ 4,800 (F) ✓$$

$$MUV = ₹ 3,300 (F)$$

3. Material Mix Variance =  $(RSQ - AQ) \times SP$

$$A = (480 - 540) \times 50 = ₹ 3,000 (A)$$

$$B = (320 - 260) \times 60 = ₹ 3,600 (F)$$

$$MMV = ₹ 600 (F)$$

4. Material Yield Variance =  $(SQ - RSQ) \times SP$

$$A = (510 - 480) \times 50 = ₹ 1,500 (F)$$

$$B = (340 - 320) \times 60 = ₹ 1,200 (F)$$

$$MYV = ₹ 2,700 (F)$$

OR Material Yield Variance (MYV)

= (Actual yield - St. yield) × St. cost per unit of output

$$= \left[ 680 - \left( \frac{680}{850} \times 800 \right) \right] \times \left( \frac{45,900}{680} \right) = ₹ 2,700 (F)$$

## Question – 2

SK Ltd. manufactures SK by mixing three raw materials. For each batch of 100 kg of SK, 125 kg of raw material are used. In June 60 batches are prepared to produce an output of 5600 kg of SK. The standard and actual particulars for June are as follows:

| Raw materials | Standard |                  | Actual |                  | Quantity of raw material purchased |
|---------------|----------|------------------|--------|------------------|------------------------------------|
|               | Mix %    | Price per kg (₹) | Mix %  | Price per kg (₹) |                                    |
| X             | 50 ✓     | 20 ✓             | 60 ✓   | 21 ✓             | 5000 ✓                             |
| Y             | 30 ✓     | 10 ✓             | 20 ✓   | 8 ✓              | 2000 ✓                             |
| Z             | 20 ✓     | 5 ✓              | 20 ✓   | 6 ✓              | 1200 ✓                             |

Calculate all variances.

$$\frac{I/P}{125} - \frac{188}{25} = \frac{O/P}{100} = \frac{100}{100}$$

1/5                      1/4

## Solution

### Basic Calculation

| Particulars | Standard                                   |      |        | Actual                                     |      |        | Revised Std. Quantity                      |
|-------------|--------------------------------------------|------|--------|--------------------------------------------|------|--------|--------------------------------------------|
|             | Quantity                                   | Rate | Amount | Quantity                                   | Rate | Amount |                                            |
| Material X  | $7,000 \times \frac{50\%}{100}$<br>= 3,500 | 20   | 70,000 | $7,500 \times \frac{60\%}{100}$<br>= 4,500 | 21   | 94,500 | $7,500 \times \frac{50\%}{100}$<br>= 3,750 |

|            |                                   |           |               |                                |          |                 |                                |
|------------|-----------------------------------|-----------|---------------|--------------------------------|----------|-----------------|--------------------------------|
| Material Y | $7,000 \times 30\%$<br>= 2,100    | <u>10</u> | 21,000        | $7,500 \times 20\%$<br>= 1,500 | <u>8</u> | 12,000          | $7,500 \times 30\%$<br>= 2,250 |
| Material Z | $7,000 \times 20\%$<br>= 1,400    | <u>5</u>  | 7,000         | $7,500 \times 20\%$<br>= 1,500 | <u>6</u> | 9,000           | $7,500 \times 20\%$<br>= 1,500 |
| Input      | <u>7,000</u>                      |           | <u>98,000</u> | $60 \times 125$<br>= 7,500     |          | <u>1,15,500</u> | <u>7,500</u>                   |
| (-) Loss   | $5,600 \times (1/4)$<br>= 1,400 ✓ |           |               | 1,900 (B/F)                    |          |                 | 1,500                          |
| Output     | <u>5,600</u>                      |           | <u>5,600</u>  |                                |          |                 | <u>6,000</u> → 45              |

### Calculation of Variances

1. Material Cost Variance = Standard Cost – Actual cost

$$X = 70,000 - 94,500 = ₹ 24,500 (A)$$

$$Y = 21,000 - 12,000 = ₹ 9,000 (F)$$

$$Z = 7,000 - 9,000 = ₹ 2,000 (A)$$

$$MCV = ₹ 17,500 (A)$$

2. Material Price Variance = (SP – AP) × AQ *Cons.*

*(on Cons. Qty.)*

$$X = (20 - 21) \times 4,500 = ₹ 4,500 (A)$$

$$Y = (10 - 8) \times 1,500 = ₹ 3,000 (F)$$

$$Z = (5 - 6) \times 1,500 = ₹ 1,500 (A)$$

$$MPV = ₹ 3,000 (A)$$

Material Price Variance = (SP – AP) × AQ *Rech.*

$$(On \text{ purchase qty.}) \quad X = (20 - 21) \times 5,000 = ₹ 5,000 (A)$$

$$Y = (10 - 8) \times 2,000 = ₹ 4,000 (F)$$

$$Z = (5 - 6) \times 1,200 = ₹ 1,200 (A)$$

$$MPV = ₹ 2,200 (A)$$

3. Material Usage (or Quantity) Variance = (SQ – AQ) × SP

$$X = (3,500 - 4,500) \times 20 = ₹ 20,000 (A)$$

$$Y = (2,100 - 1,500) \times 10 = ₹ 6,000 (F)$$

$$Z = (1,400 - 1,500) \times 5 = ₹ 500 (A)$$

$$MUV = ₹ 14,500 (A)$$

4. Material Mix Variance = (RSQ – AQ) × SP

$$X = (3,750 - 4,500) \times 20 = ₹ 15,000 (A)$$

$$Y = (2,250 - 1,500) \times 10 = ₹ 7,500 (F)$$

$$Z = (1,500 - 1,500) \times 5 = ₹ \text{NIL}$$

$$MMV = ₹ 7,500 (A)$$

5. Material Yield Variance = (SQ - RSQ) × SP

$$X = (3,500 - 3,750) \times 20 = ₹ 5,000 (A)$$

$$Y = (2,100 - 2,250) \times 10 = ₹ 1,500 (A)$$

$$Z = (1,400 - 1,500) \times 5 = ₹ 500 (A)$$

$$MYV = ₹ 7,000 (A)$$

OR Material Yield Variance (MYV)

= (Actual yield – St. yield) × St. cost per unit of output

$$= \left[ 5,600 - \left( \frac{100}{125} \times 7,500 \right) \right] \times \left( \frac{98,000}{5,600} \right) = ₹ 7,000 (A)$$

### Question – 3

Following data is extracted from the books of SK Ltd. for the month of May, 2021:

(i) Estimation-

| Particulars  | Quantity (kg) | Price(₹) | Amount (₹) |
|--------------|---------------|----------|------------|
| Material – A | 800           | ?        | -          |
| Material – B | 600           | 30.00    | 18,000     |
|              |               |          | -          |

Normal loss was expected to be 10% of total input materials.

(ii) Actuals-

1,480 kg of output produced

| Particulars  | Quantity (kg) | Price(₹) | Amount (₹) |
|--------------|---------------|----------|------------|
| Material – A | 900           | ?        | -          |
| Material – B | ?             | 32.50    | -          |
|              |               |          | 59,825     |

(iii) Other information-

Material cost variance = ₹ 3,625 (F)

Material price variance = ₹ 175 (F)

$$A. I/P = \frac{1480}{90\%} = 1644.44$$

You are required to calculate:

- Standard price of Material-A
- Actual quantity of Material-B
- Actual price of Material-A
- Revised standard quantity of Material-A and Material-B; and
- Material Mix Variance

### Solution

(i) Material cost variance = Standard cost – Actual cost

$$3,625 (F) = \text{Standard cost} - 59,825$$

$$3,625 = \text{Standard cost} - 59,825$$

$$\text{Standard cost} = 63,450$$

$$\text{Total standard input required for actual output} = \frac{1,480}{90\%} = 1,645 \text{ kg}$$

$$\text{Standard quantity of material A} = \frac{800}{(800+600)} \times 1,645 = 940 \text{ kg}$$

$$\text{Standard quantity of material B} = \frac{600}{(800+600)} \times 1,645 = 705 \text{ kg}$$

$$\text{Standard cost of Material A} + \text{Standard cost of Material B} = 63,450$$

$$(SQ_A \times SP_A) + (SQ_B \times SP_B) = 63,450$$

$$(940 \times SP_A) + (705 \times 30) = 63,450$$

$$SP_A = \frac{42,300}{940}$$

$$\text{Standard price of material A} = ₹ 45$$

$$(ii) \text{ Material price variance} = (AQ \times SP) - (AQ \times AP)$$

$$175 (F) = (AQ \times SP) - 59,825$$

$$175 = (AQ \times SP) - 59,825$$

$$AQ \times SP = 60,000$$

$$(AQ_A \times SP_A) + (AQ_B \times SP_B) = 60,000$$

$$(900 \times 45) + (AQ_B \times 30) = 60,000$$

$$AQ_B = \frac{19,500}{30}$$

$$\text{Actual quantity of material B} = 650 \text{ kg}$$

$$(iii) \text{ Given, } AQ \times AP = 59,825$$

$$(AQ_A \times AP_A) + (AQ_B \times AP_B) = 59,825$$

$$(900 \times AP_A) + (650 \times 32.50) = 59,825$$

$$AP_A = \frac{38,700}{900}$$

$$\text{Actual price of material A} = ₹ 43$$

$$(iv) \text{ Total actual input quantity} = 900 + 650 = 1,550 \text{ kg}$$

$$\text{Revised standard quantity of material A} = \frac{800}{(800+600)} \times 1,550 = 886 \text{ kg}$$

$$\text{Revised standard quantity of material B} = \frac{600}{(800+600)} \times 1,550 = 664 \text{ kg}$$

$$(v) \text{ Material Mix Variance} = (RSQ - AQ) \times SP$$

$$\text{Material A} = (886 - 900) \times 45 = ₹ 630 (A)$$

$$\text{Material B} = (664 - 650) \times 30 = ₹ 420 (F)$$

$$₹ 210 (A)$$

#### Question – 4

A gang of workers normally consists of 30 skilled workers, 15 semi-skilled workers and 10 unskilled workers. They are paid at standard rate per hour as under:

|              |      |
|--------------|------|
| Skilled      | ₹ 70 |
| Semi-skilled | ₹ 65 |
| Unskilled    | ₹ 50 |

In a normal working week of 40 hours, the gang is expected to produce 2,000 units of output. During the week ended 31<sup>st</sup> March, 2019, the gang consisted of 40 skilled, 10 semi-skilled and 5 unskilled workers. The actual wages paid were at the rate of ₹ 75, ₹ 60 and ₹ 52 per hour respectively. Four hours were lost due to machine breakdown and 1,600 units were produced.

Calculate the following variances showing clearly adverse (A) or favorable (F)

- |                                  |                           |
|----------------------------------|---------------------------|
| (i) Labour Cost Variance         | (ii) Labour Rate Variance |
| (iii) Labour Efficiency Variance | (iv) Labour Mix Variance  |
| (v) Labour Idle Time variance    |                           |

#### Solution

##### Basic Calculation

| Particulars  | Standard (1,600 units)                          |      |          | Actual (1,600 units)                 |      |          | Revised Std. Qty.                        |
|--------------|-------------------------------------------------|------|----------|--------------------------------------|------|----------|------------------------------------------|
|              | Quantity                                        | Rate | Amount   | Quantity                             | Rate | Amount   |                                          |
| Skilled      | $\frac{40 \times 30}{2,000} \times 1,600 = 960$ | 70   | 67,200   | $\frac{40 \times 40}{1,600} = 1,000$ | 75   | 1,20,000 | $\frac{960}{1,760} \times 1,980 = 1,080$ |
| Semi-skilled | $\frac{40 \times 15}{2,000} \times 1,600 = 480$ | 65   | 31,200   | $\frac{40 \times 10}{400} = 1,000$   | 60   | 24,000   | $\frac{480}{1,760} \times 1,980 = 540$   |
| Unskilled    | $\frac{40 \times 10}{2,000} \times 1,600 = 320$ | 50   | 16,000   | $\frac{40 \times 5}{200} = 1,000$    | 52   | 10,400   | $\frac{320}{1,760} \times 1,980 = 360$   |
| Total        | 1,760                                           |      | 1,14,400 | 2,200                                |      | 1,54,400 | 1,980                                    |

| Particulars  | Hours Paid             | Idle Hours          | Hours Worked          |
|--------------|------------------------|---------------------|-----------------------|
| Skilled      | $40 \times 40 = 1,600$ | $40 \times 4 = 160$ | $1,600 - 160 = 1,440$ |
| Semi-skilled | $40 \times 10 = 400$   | $10 \times 4 = 40$  | $400 - 40 = 360$      |
| Unskilled    | $40 \times 5 = 200$    | $5 \times 4 = 20$   | $200 - 20 = 180$      |
| Total        | 22,00                  | 220                 | 1,980                 |

##### Calculation of Variances

- (i) Labour Cost Variance = Standard Cost – Actual cost

|              |                       |                  |
|--------------|-----------------------|------------------|
| Skilled      | $= 67,200 - 1,20,000$ | $= ₹ 52,800$ (A) |
| Semi-skilled | $= 31,200 - 24,000$   | $= ₹ 7,200$ (F)  |
| Unskilled    | $= 16,000 - 10,400$   | $= ₹ 5,600$ (F)  |
| LCV          | $= ₹ 40,000$          | (A)              |

(ii) Labour Rate Variance =  $(SR - AR) \times \text{AH paid}$

|              |                            |     |           |
|--------------|----------------------------|-----|-----------|
| Skilled      | $= (70 - 75) \times 1,600$ | = ₹ | 8,000 (A) |
| Semi-Skilled | $= (65 - 60) \times 400$   | = ₹ | 2,000 (F) |
| Unskilled    | $= (50 - 52) \times 200$   | = ₹ | 400 (A)   |
| LRV          |                            | = ₹ | 6,400 (A) |

(iii) Labour Efficiency Variance =  $(SH - \text{AH worked}) \times SR$

|              |                             |     |            |
|--------------|-----------------------------|-----|------------|
| Skilled      | $= (960 - 1,440) \times 70$ | = ₹ | 33,600 (A) |
| Semi-Skilled | $= (480 - 360) \times 65$   | = ₹ | 7,800 (F)  |
| Unskilled    | $= (320 - 180) \times 50$   | = ₹ | 7,000 (F)  |
| LEV          |                             | = ₹ | 18,800 (A) |

(iv) Labour Mix Variance =  $(RSH - \text{AH worked}) \times SR$

|              |                               |     |            |
|--------------|-------------------------------|-----|------------|
| Skilled      | $= (1,080 - 1,440) \times 70$ | = ₹ | 25,200 (A) |
| Semi-Skilled | $= (540 - 360) \times 65$     | = ₹ | 11,700 (F) |
| Unskilled    | $= (360 - 180) \times 50$     | = ₹ | 9,000 (F)  |
| LMV          |                               | = ₹ | 4,500 (A)  |

(v) Idle Time Variance =  $\text{Idle Hours} \times SR$

|                    |                   |     |            |
|--------------------|-------------------|-----|------------|
| Skilled            | $= 160 \times 70$ | = ₹ | 11,200 (A) |
| Semi-Skilled       | $= 40 \times 65$  | = ₹ | 2,600 (A)  |
| Unskilled          | $= 20 \times 50$  | = ₹ | 1,000 (A)  |
| Idle time variance |                   | = ₹ | 14,800 (A) |

### Question – 5

The standard output of product 'DJ' is 25 units per hour in manufacturing department of a company employing 100 workers. In a 40 hours week, the department produced 960 units of product 'DJ' despite 5% of the time paid was lost due to an abnormal reason. The hourly wage rates actually paid were ₹ 6.20, ₹ 6.00 and ₹ 5.70 respectively to group 'A' consisting 10 workers, Group 'B' consisting 30 workers and Group 'C' consisting 60 workers. The standard wage rate per labour is same for all the workers. Labour Efficiency Variance is given ₹ 240 (F).

You are required to calculate:

- Total Labour Cost Variance
- Total Labour rate Variance
- Total Labour Gang Variance
- Total Labour Yield Variance, and
- Total Labour Idle Time Variance

25 units  $\rightarrow$  1 x 100 w.Hrs.  
1 unit  $\rightarrow$   $\frac{100}{25} = 4$  w.Hrs.

### Solution

Labour Efficiency Variance =  $(SH - \text{AH worked}) \times SR$

$$240 (F) = \left[ \left( 960 \times \frac{100}{25} \right) - \{ (10 + 30 + 60) \times (40 - 5\%) \} \right] \times SR$$

$$240 = (3,840 - 3,800) \times SR$$

$$SR = ₹ 6$$

| Particulars | Standard (960 units)                |      |          |
|-------------|-------------------------------------|------|----------|
|             | Quantity                            | Rate | Amount   |
| Labour      | $960 \times \frac{100}{25} = 3,840$ | 6    | 23,040 ✓ |

| Actual data (960 units)         |                          |           |        |                          |                       |
|---------------------------------|--------------------------|-----------|--------|--------------------------|-----------------------|
| <u>6.8.18</u><br>No. of workers | Hours paid               | Wage rate | Wages  | Idle hours               | Hours worked          |
| A ✓ 10                          | $10 \times 40 = 400$ ✓   | 6.20 ✓    | 2,480  | $400 \times 5\% = 20$    | $400 - 20 = 380$      |
| B ✓ 30                          | $30 \times 40 = 1,200$ ✓ | 6         | 7,200  | $1,200 \times 5\% = 60$  | $1,200 - 60 = 1,140$  |
| C ✓ 60                          | $60 \times 40 = 2,400$ ✓ | 5.70 ✓    | 13,480 | $2,400 \times 5\% = 120$ | $2,400 - 120 = 2,280$ |
| Total                           | 4,000                    |           | 23,360 | 200                      | 3,800                 |

### Calculation of Variances

- (i) Labour Cost Variance = Standard Cost – Actual cost  
= 23,040 – 23,360 = ₹ 320 (A)
- (ii) Labour Rate Variance = (SR – AR) × AH paid  
=  $[(6 - 6.20) \times 400] + [(6 - 6) \times 1,200] + [(6 - 5.70) \times 2,400] = ₹ 640 (F)$
- (iii) Labour Gang Variance = (RSH – AH worked) × SR ✓  
=  $(3,800 - 3,800) \times 6 = \text{Nil}$
- (iv) Labour Yield Variance = (Actual yield – St. yield) × St. cost per unit of output  
=  $\left[960 - \left(\frac{960}{3,840} \times 3,800\right)\right] \times \left(\frac{23,040}{960}\right) = ₹ 240 (F)$
- (v) Idle Time Variance = Idle Hours × SR  
=  $200 \times 6 = ₹ 1,200 (A)$  }

### Question – 6

SK Ltd. had prepared the following estimation for the month of January:

|                  | Quantity    | Rate (₹) | Amount (₹) |
|------------------|-------------|----------|------------|
| Material – A     | 800 kg      | 90.00    | 72,000     |
| Material – B     | 600 kg      | 60.00    | 36,000     |
| Skilled Labour   | 1,000 hours | 75.00    | 75,000     |
| Unskilled Labour | 800 hours   | 44.00    | 35,200     |

Normal loss was expected to be 10% of total input materials and an idle labour time of 5% of expected labour hours was also estimated.

↓  
No. 1688

At the end of the month the following information has been collected from the cost accounting

department:

The company has produced 1,480 kg finished product by using the followings:

|                  | Quantity    | Rate (₹) | Amount (₹) |
|------------------|-------------|----------|------------|
| Material – A     | 900 kg      | 86.00    | 77,400     |
| Material – B     | 650 kg      | 65.00    | 42,250     |
| Skilled Labour   | 1,200 hours | 71.00    | 85,200     |
| Unskilled Labour | 860 hours   | 46.00    | 39,560     |

You are required to calculate:

- Material cost variance
- Material price variance
- Material mix variance
- Material yield variance
- Labour cost variance
- Labour efficiency variance
- Labour yield variance

### Solution

#### Basic Calculation for material

| Particulars | Standard                          |      |          | Actual   |      |          | Revised Std. Qty.                 |
|-------------|-----------------------------------|------|----------|----------|------|----------|-----------------------------------|
|             | Quantity                          | Rate | Amount   | Quantity | Rate | Amount   |                                   |
| Material A  | $\frac{8}{14} \times 1,644 = 939$ | 90   | 84,510   | 900      | 86   | 77,400   | $\frac{8}{14} \times 1,550 = 886$ |
| Material B  | $\frac{6}{14} \times 1,644 = 705$ | 60   | 42,300   | 650      | 65   | 42,250   | $\frac{6}{14} \times 1,550 = 664$ |
| Input       | $1,480 \div 90\% = 1,644$         |      | 1,26,810 | 1,550    |      | 1,19,650 | 1,550                             |
| (-) Loss    | 164                               |      |          | 70 (B/F) |      |          | 155                               |
| Output      | 1,480                             |      |          | 1,480    |      |          | 1,395                             |

#### Basic Calculation for labour

| Particulars | Standard                                                           |      |          | Actual   |      |          | Revised Std. Qty.                          |
|-------------|--------------------------------------------------------------------|------|----------|----------|------|----------|--------------------------------------------|
|             | Quantity                                                           | Rate | Amount   | Quantity | Rate | Amount   |                                            |
| Skilled     | $\frac{1,000}{1,800} \times 2,008 = 1,115$                         | 75   | 83,625   | 1,200    | 71   | 85,200   | $\frac{1,115}{2,008} \times 2,060 = 1,144$ |
| Unskilled   | $\frac{800}{1,800} \times 2,008 = 893$                             | 44   | 38,852   | 860      | 46   | 39,560   | $\frac{893}{2,008} \times 2,060 = 916$     |
| Total       | $\frac{1,800 \times 0.95 \times 1,480}{1,400 \times 0.90} = 2,008$ |      | 1,22,477 | 2,060    |      | 1,24,760 | 2,060                                      |

$$\frac{\text{Std. Hrs. work}}{\text{Std. o/p}} \times \text{Actual o/p}$$

### Calculation of Variances

(a) Material Cost Variance = Standard Cost – Actual cost

$$\begin{aligned} A &= 84,510 - 77,400 &= ₹ & 7,110 \text{ (F)} \\ B &= 42,300 - 42,250 &= ₹ & 50 \text{ (F)} \\ \text{MCV} &= ₹ & 7,160 \text{ (F)} \end{aligned}$$

(b) Material Price Variance = (SP – AP) × AQ

$$\begin{aligned} A &= (90 - 86) \times 900 &= ₹ & 3,600 \text{ (F)} \\ B &= (60 - 65) \times 650 &= ₹ & 3,250 \text{ (A)} \\ \text{MPV} &= ₹ & 350 \text{ (F)} \end{aligned}$$

(c) Material Mix Variance = (RSQ - AQ) × SP

$$\begin{aligned} A &= (886 - 900) \times 90 &= ₹ & 1,260 \text{ (A)} \\ B &= (664 - 650) \times 60 &= ₹ & 840 \text{ (F)} \\ \text{MMV} &= ₹ & 420 \text{ (A)} \end{aligned}$$

(d) Material Yield Variance = (SQ - RSQ) × SP

$$\begin{aligned} A &= (939 - 886) \times 90 &= ₹ & 4,770 \text{ (F)} \\ B &= (705 - 664) \times 60 &= ₹ & 2,460 \text{ (F)} \\ \text{MYV} &= ₹ & 7,230 \text{ (F)} \end{aligned}$$

OR Material Yield Variance (MYV)

= (Actual yield – St. yield) × St. cost per unit of output

$$= \left[ 1,480 - \left( \frac{1,480}{1,644} \times 1,550 \right) \right] \times \left( \frac{1,26,810}{1,480} \right) = ₹ 7,251 \text{ (F)}$$

(e) Labour Cost Variance = Standard Cost – Actual cost

$$\begin{aligned} \text{Skilled} &= 83,625 - 85,200 &= ₹ & 1,575 \text{ (A)} \\ \text{Unskilled} &= 38,852 - 39,560 &= ₹ & 708 \text{ (A)} \\ \text{LCV} &= ₹ & 2,283 \text{ (A)} \end{aligned}$$

(f) Labour Efficiency Variance = (SH – AH worked) × SR

$$\begin{aligned} \text{Skilled} &= (1,115 - 1,200) \times 75 &= ₹ & 6,375 \text{ (A)} \\ \text{Unskilled} &= (893 - 860) \times 44 &= ₹ & 1,452 \text{ (F)} \\ \text{LEV} &= ₹ & 4,924 \text{ (A)} \end{aligned}$$

(g) Labour Yield Variance = (SH - RSH) × SR

$$\begin{aligned} \text{Skilled} &= (1,115 - 1,144) \times 75 &= ₹ & 2,175 \text{ (A)} \\ \text{Unskilled} &= (893 - 916) \times 44 &= ₹ & 1,012 \text{ (A)} \\ \text{LYV} &= ₹ & 3,188 \text{ (A)} \end{aligned}$$

OR Labour Yield Variance (LYV)

= (Actual yield – St. yield) × St. cost per unit of output

$$= \left[ 1,480 - \left( \frac{1,480}{2,008} \times 2,060 \right) \right] \times \left( \frac{1,22,477}{1,480} \right) = ₹ 3,171 \text{ (A)}$$

### Question – 7

A company operates a standard costing system and showed the following data for the month of March:

|                          | Actual    | Budgeted         |
|--------------------------|-----------|------------------|
| No. of working days      | → 22      | 20               |
| Man-hours                | → 4,300   | 4,000 ✓          |
| Overhead rate per hour   | → -       | ₹ 0.50 <i>PR</i> |
| Hours per unit of output | -         | 10 ✓             |
| Fixed overhead incurred  | → ₹ 1,800 | -                |
| No. of units produced    | → 425     | -                |

Calculate:

- |                            |                         |
|----------------------------|-------------------------|
| (a) Overhead cost variance | (b) Budget variance     |
| (c) Volume variance        | (d) Capacity variance   |
| (e) Calendar variance      | (f) Efficiency variance |

### Solution

#### Basic Calculations:

|                                                                |                                           |                       |                                                                 |
|----------------------------------------------------------------|-------------------------------------------|-----------------------|-----------------------------------------------------------------|
|                                                                | Budgeted Hours<br>4,000 ✓                 | Recovery Rate<br>0.50 | Budgeted Overheads<br>$4,000 \times 0.50 = 2,000$ ✓ <i>Exp.</i> |
| Revised Budgeted Hours<br>$\frac{4,000}{20} \times 22 = 4,400$ | Actual Hours<br>4,300 <i>Eff.</i>         |                       | Actual Overheads<br>1,800 <i>Cost</i>                           |
|                                                                | Standard Hours<br>$10 \times 425 = 4,250$ | Recovery Rate<br>0.50 | Recovered Overheads<br>2,125 ✓                                  |

#### Calculation of Variances

- |                         |                                                                                                    |
|-------------------------|----------------------------------------------------------------------------------------------------|
| (a) F. O. Cost Variance | = Recovered overhead – Actual overhead<br>= 2,125 – 1,800 = ₹ 325 (F)                              |
| (b) Budget Variance     | = Budgeted overhead – Actual overhead<br>= 2,000 – 1,800 = ₹ 200 (F)                               |
| (c) Volume Variance     | = Recovered overhead – Budgeted overhead<br>= 2,125 – 2,000 = ₹ 125 (F)                            |
| (d) Capacity Variance   | = (Actual Hrs. – Revised Budgeted Hrs.) × Recovery Rate<br>= (4,300 – 4,400) × 0.50 = ₹ 50 (A)     |
| (e) Calendar Variance   | = (Revised Budgeted Hrs. – Budgeted Hours) × Recovery Rate<br>= (4,400 – 4,000) × 0.50 = ₹ 200 (F) |
| (f) Efficiency Variance | = (Std. Hrs. – Actual Hrs.) × Recovery Rate<br>= (4,250 – 4,300) × 0.50 = ₹ 25 (A)                 |

### Question – 8

A manufacturing concern has provided following information related to fixed overheads:

|                           | Standard     | Actual        |
|---------------------------|--------------|---------------|
| Output in a month →       | 5,000 units  | 4,800 units ✓ |
| Working days in a month → | 25 days ✓    | 23 days ✓     |
| Fixed overheads →         | ₹ 5,00,000 ✓ | ₹ 4,90,000    |

Compute:

- Fixed overhead variance
- Fixed overhead expenditure variance
- Fixed overhead volume variance
- Fixed overhead efficiency variance

Handwritten calculations for Question 8:

- Budgeted:** 5000 units, 25 days, ₹ 5,00,000
- Actual:** 4800 units, 23 days, ₹ 4,90,000
- Standard:** 4800 units, 24 days, ₹ 4,80,000
- Recovery Rate (RR):**  $\frac{₹ 5,00,000}{25 \text{ days}} = ₹ 20,000/\text{day}$
- Recovered Overhead (R.O.H.):**  $24 \text{ days} \times ₹ 20,000 = ₹ 4,80,000$
- Expenditure Variance (Exp. Var.):**  $₹ 5,00,000 - ₹ 4,90,000 = ₹ 10,000 \text{ (F)}$
- Volume Variance (Vol. Var.):**  $₹ 4,80,000 - ₹ 5,00,000 = ₹ 20,000 \text{ (A)}$
- Efficiency Variance (Eff. Var.):**  $(24 - 23) \times ₹ 20,000 = ₹ 20,000 \text{ (F)}$

### Solution

#### Basic Calculations:

|                                                              |                                                     |                                        |
|--------------------------------------------------------------|-----------------------------------------------------|----------------------------------------|
| <b>Budgeted Days</b><br>25                                   | <b>Recovery Rate</b><br>$5,00,000 \div 25 = 20,000$ | <b>Budgeted Overheads</b><br>5,00,000  |
| <b>Actual Days</b><br>23                                     |                                                     | <b>Actual Overheads</b><br>4,90,000    |
| <b>Standard Days</b><br>$\frac{25}{5,000} \times 4,800 = 24$ | <b>Recovery Rate</b><br>20,000                      | <b>Recovered Overheads</b><br>4,80,000 |

#### Calculation of Variances

- F. O. Cost Variance = Recovered overhead – Actual overhead  
= 4,80,000 – 4,90,000 = ₹ 10,00 (A)
- Expenditure Variance = Budgeted overhead – Actual overhead  
= 5,00,000 – 4,90,000 = ₹ 10,000 (F)
- Volume Variance = Recovered overhead – Budgeted overhead  
= 4,80,000 – 5,00,000 = ₹ 20,000 (A)
- Efficiency Variance = (Std. days – Actual days) × Recovery Rate  
= (24 – 23) × 20,000 = ₹ 20,000 (F)

### Question – 9

In a manufacturing company the standard units of production of the year were fixed at 1,20,000 units and overhead expenditures were estimated to be:

Fixed → ₹ 12,00,000      Variable → ₹ 6,00,000  
Semi-variable → ₹ 1,80,000

Actual production during the June, 2021 of the year was 8,000 units. Each month has 20 working days.

During the month there was one public holiday. The actual overheads amounted to:

Fixed → ₹ 1,10,000      Variable → ₹ 48,000

Semi-variable → ₹ 19,200

$$F = 11520$$

$$V = 7680$$

Semi-variable charges are considered to include 60 per cent expenses of fixed nature and 40 per cent of variable character.

Calculate the following:

- Overhead cost variance
- Fixed overhead cost variance
- Variable overhead cost variance
- Fixed overhead volume variance
- Fixed overhead expenditure variance
- Calendar variance

| Part. | Std. (8000) |      |       | Actual (8000) |      |       |
|-------|-------------|------|-------|---------------|------|-------|
|       | Q           | R    | A     | Q             | R    | A     |
| V.OH  | 8000        | 5.60 | 44800 | 8000          | 6.96 | 55680 |

### Solution

#### Basic Calculations:

- (1) Fixed overheads out of semi-variable overheads =  $1,80,000 \times 60\% = ₹ 1,08,000$  ✓

$$\therefore \text{Total Fixed overheads p.a.} = 12,00,000 + 1,08,000 = ₹ 13,08,000$$

$$\text{Total Fixed overheads per month} = 13,08,000 \div 12 = ₹ 1,09,000$$

$$\text{Fixed overheads per unit} = \frac{1,09,000}{1,20,000 \div 12} = ₹ 10.90$$

- (2) Variable overheads out of semi-variable overheads =  $1,80,000 \times 40\% = ₹ 72,000$  ✓

$$\therefore \text{Total variable overheads p.a.} = 6,00,000 + 72,000 = ₹ 6,72,000$$

$$\text{Total variable overheads per month} = 6,72,000 \div 12 = ₹ 56,000$$

$$\text{Variable overheads per unit} = \frac{56,000}{1,20,000 \div 12} = ₹ 5.60$$

- (3) Variable overheads recovered =  $8,000 \times 5.60 = ₹ 44,800$

- (4) Total actual fixed overheads =  $1,10,000 + (19,200 \times 60\%) = ₹ 1,21,520$

$$\text{Total actual variable overheads} = 48,000 + (19,200 \times 40\%) = ₹ 55,680 \quad \checkmark$$

- (5) For Fixed Overheads

|                                                             |                            |                        |                            |
|-------------------------------------------------------------|----------------------------|------------------------|----------------------------|
|                                                             | Budgeted Units<br>10,000 ✓ | Recovery Rate<br>10.90 | Budgeted OHs<br>1,09,000 ✓ |
| Revised Bud. Units<br>$\frac{10,000}{20} \times 19 = 9,500$ | Actual Units<br>8,000 ✓    |                        | Actual OHs<br>1,21,520 ✓   |
|                                                             | Standard Units<br>8,000    | Recovery Rate<br>10.90 | Recovered OHs<br>87,200 ✓  |

### Calculation of Variances

- (a) Overhead Cost Variance = Recovered Overheads – Actual Overheads  
=  $(87,200 + 44,800) - (1,21,520 + 55,680) = ₹ 45,200 (A)$
- (b) Fixed OHs Cost Variance = Recovered Fixed OHs – Actual Fixed OHs  
=  $87,200 - 1,21,520 = ₹ 34,320 (A)$
- (c) Variable OHs Cost Variance = Recovered Variable OHs – Actual Variable OHs  
=  $44,800 - 55,680 = ₹ 10,880 (A)$
- (d) Fixed OHs Volume Variance = Recovered Fixed OHs – Budgeted Fixed OHs  
=  $87,200 - 1,09,000 = ₹ 21,800 (A)$
- (e) Fixed OHs Expenditure Variance = Budgeted overhead – Actual overhead  
=  $1,09,000 - 1,21,520 = ₹ 12,520 (A)$
- (f) Calendar Variance = (Revised Bud. units – Budget units) × Recovery rate  
=  $(9,500 - 10,000) \times 10.90 = ₹ 5,450 (A)$

### Question – 10

ABC Ltd. has furnished the following information regarding the overheads for the month of June 2020:

- (i) Fixed overhead cost variance → ₹ 2,800 (Adverse)  
(ii) Fixed overhead volume variance → ₹ 2,000 (Adverse)  
(iii) Budgeted Hours for June, 2020 → 2,400 hours  
(iv) Budgeted Overheads for June, 2020 → ₹ 12,000  
(v) Actual rate of recovery of overheads → ₹ 8 per hour (RR)  
Actual
- Handwritten calculation:  $RR = \frac{12000}{2400} = 5$

From the above given information calculate:

- (i) Fixed overhead expenditure variance  
(ii) Actual overheads incurred  
(iii) Actual hours for actual production  
(iv) Fixed overhead capacity variance  
(v) Standard hours for actual production  
(vi) Fixed overhead efficiency variance

### Solution

Computation of required variances for February 2019:

1. Overheads expenditure variance = Overhead Cost Variance – Overheads Volume variance  
= ₹ 2,800(A) – ₹ 2,000(A) = - ₹ 2,800 – (- ₹ 2,000) = - ₹ 800 = ₹ 800 (A)
2. Actual Overheads incurred = Budgeted Overhead - Overhead Expenditure Variance  
= ₹ 12,000 - ₹ 800(A) = ₹ 12,000 – (- ₹ 800) = ₹ 12,000 + ₹ 800 = ₹ 12,800
3. Actual hours for actual production =  $\frac{\text{Actual Overheads Incurred}}{\text{Actual Rate of Recovery Overhead Per Hour}} = \frac{12,800}{8} = 1,600 \text{ hours}$
4. Overheads Capacity Variance = Std rate of OH rate (Actual hrs for actual production – Budgeted hours)  
= ₹ 5 × (1,600 – 2,400) = ₹ 5 × (- 800) = ₹ 4,000 Adverse

$$\text{* Standard rate of Overhead recovery} = \frac{\text{Budgetary Overheads}}{\text{Budgeted hours}} = \frac{12,000}{2,400 \text{ hours}} = ₹ 5 \text{ per hour}$$

5. Volume Variance = Std. rate of OHs recovery (Standard hours for actual production – Budgeted hours)

$$\text{or, } ₹ 2,000(A) = ₹ 5 [\text{Std. hrs.} - 2,400 \text{ hours}]$$

$$\text{or, Std. hrs.} - 2,400 \text{ hours} = - \frac{2,000}{5}$$

$$\text{or, Std. hrs.} - 2,400 \text{ hours} = - 400 \text{ hours}$$

$$\text{or, Std. hrs.} = 2,400 \text{ hours} - 400 \text{ hours}$$

Standard hours for actual production = 2,000 hours

6. Fixed overhead efficiency variance = (Std. hours for AO – Actual Hrs.) × SR  
 $= (2,000 - 1,600) \times 5 = 2,000 (F)$

Or

Fixed overhead efficiency variance = Volume variance – Capacity Variance

$$= ₹ 2,000(A) - ₹ 4,000(A) = - ₹ 2,000 - (- ₹ 4,000) = - ₹ 2,000 + ₹ 4,000 = ₹ 2,000 (F)$$

### Question – 11

SK Ltd. manufactures a commercial product for which the standard cost per unit is as follows:

|                    |                         |       |
|--------------------|-------------------------|-------|
| Material:          | 5 kg. @ ₹ 4 per kg.     | 20.00 |
| Labour:            | 3 hours @ ₹ 10 per hour | 30.00 |
| Variable Overhead: | 3 hours @ ₹ 1           | 3.00  |
| Fixed Overhead:    | 3 hours @ ₹ 0.50        | 1.50  |
| Total              |                         | 54.50 |

During May 2021, 600 units of the product were manufactured at the cost shown below:

|                                                        | ₹      |
|--------------------------------------------------------|--------|
| Materials <u>purchased</u> : 5,000 kg. @ ₹ 4.10 per kg | 20,500 |
| Materials <u>used</u> : 3,500 kg                       |        |
| Direct Labour: 1,700 hours @ ₹ 9                       | 15,300 |
| Variable overhead                                      | 1,900  |
| Fixed overhead                                         | 900    |
| Total                                                  | 38,600 |

The flexible budget required 1,800 direct labour hours for operation at the monthly activity level used to set the fixed overhead rate.

Calculate:

(a) Material price variance

(c) Labour rate variance

(e) Variable overhead expenditure variance

(g) Fixed overhead expenditure variance

(i) Fixed overhead capacity variance

(b) Material Usage variance

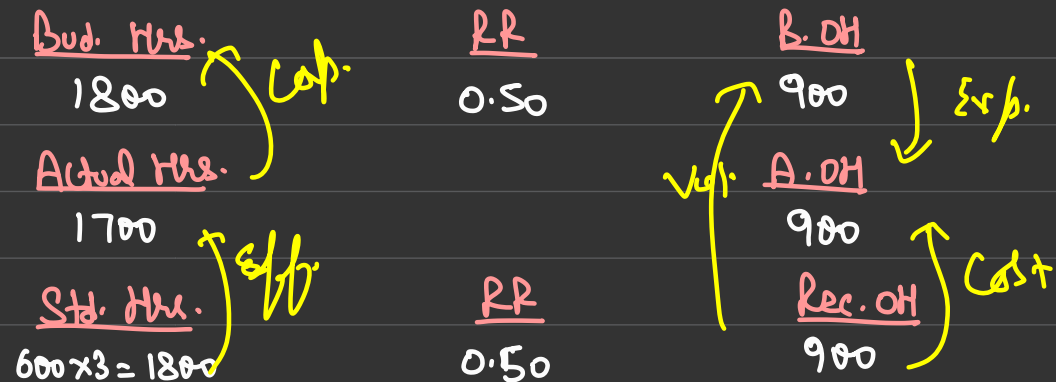
(d) Labour efficiency variance

(f) Variable overhead efficiency variance

(h) Fixed overhead volume variance

(j) Fixed overhead efficiency variance

|              | <u>Std. (O/P = 600)</u> |          |          | <u>Actual (O/P = 600)</u> |                              |          |
|--------------|-------------------------|----------|----------|---------------------------|------------------------------|----------|
| <u>Part.</u> | <u>Q</u>                | <u>R</u> | <u>A</u> | <u>Q</u>                  | <u>R</u>                     | <u>A</u> |
| Mat.         | $600 \times 5 = 3000$   | 4        | 12000    | 3500                      | 4.10                         | 14350    |
| Labour       | $600 \times 3 = 1800$   | 10       | 18000    | 1700                      | 9                            | 15300    |
| V. OHs       | $600 \times 3 = 1800$   | 1        | 1800     | 1700                      | $\frac{1900}{1700} = 1.1176$ | 1900     |



### Solution

- (a) Material price variance = (Standard price – Actual Price) × Actual quantity  
= (₹ 4 – ₹ 4.10) × 5,000 = ₹ 500(A)
- (b) Material usage variance = (Std. quantity for actual output – Actual qty.) × Std. price  
= (600 × 5 – 3,500) × 4 = ₹ 2,000(A)
- (c) Labour Rate Variance = (Standard rate – Actual rate) × Actual hours  
= (₹ 10 – ₹ 9) × 1,700 = ₹ 1,700(F)
- (d) Labour Efficiency Variance = (Standard hrs for actual output – Actual hrs) × Standard rate  
= (600 × 3 – 1,700) × ₹ 10 = ₹ 1,000(F)
- (e) Variable OHs Expenditure Variance = (Actual Hrs x Standard Rate) – Actual Overhead  
= (1700 x ₹ 1) – ₹ 1900 = ₹ 200(A)
- (f) Variable Overhead Efficiency Variance = Std. hrs for actual output – Actual hrs) × Std. rate  
= (600 × 3 – 1,700) × ₹ 1 = ₹ 100(F)
- (g) Fixed Overhead Expenditure Variance = (Budgeted overhead – Actual overhead)  
= (1,800 × 0.50 – 900) = Nil
- (h) Fixed Overhead Volume Variance = (Std. hrs for actual output – Bud. hrs.) × Std. rate  
= (600 × 3 – 1,800) × ₹ 0.50 = Nil
- (i) Fixed Overhead Capacity Variance = (Budgeted hours – Actual Hours) × Standard rate  
= (1,800 – 1,700) × ₹ 0.50 = ₹ 50(A)
- (j) Fixed Overhead Efficiency Variance = (Std. hrs. for actual output – Actual hrs.) × Std rate  
= (600 × 3 – 1,700) × ₹ 0.50 = ₹ 50(F)

### Question – 12

Following data is available for ABC Ltd.:

|                                                    |                                      |
|----------------------------------------------------|--------------------------------------|
| Standard working hours                             | → 8 hours per day of 5 days per week |
| Maximum capacity                                   | → 60 employees                       |
| Actual working                                     | → 50 employees                       |
| Actual hours expected to be worked per four week   | 8,000 hours                          |
| Standard hours expected to be earned per four week | 9,600 hours                          |
| Actual hours worked in the four week period        | 7,500 hours ✓ (AH)                   |
| Standard hours earned in the four week period      | 8,800 hours ✓ (SH)                   |

The related period is of four weeks. Calculate the following Ratios:

- Efficiency ratio
- Activity ratio
- Standard capacity usage ratio
- Actual capacity usage ratio
- Actual usage of Budgeted capacity ratio

## Solution

### **Working Notes:**

- (1) Max. capacity in a budget period = 60 employees × 8 hrs. × 5 days × 4 weeks = 9,600 hrs. ✓
- (2) Budgeted hours = 50 employees × 8 hrs. × 5 days × 4 weeks = 8,000 hrs. ✓
- (3) Actual hours = 7,500 hrs. (given)
- (4) Standard hours for actual output = 8,800 hours

### **Calculation of ratios:**

- (i) Efficiency ratio =  $\frac{\text{Standard Hours}}{\text{Actual Hours}} \times 100 = \frac{8,800}{7,500} \times 100 = 117.33\%$
- (ii) Activity ratio =  $\frac{\text{Standard Hours}}{\text{Budgeted Hours}} \times 100 = \frac{8,800}{8,000} \times 100 = 110\%$
- (iii) Standard Capacity Usage ratio =  $\frac{\text{Budgeted Hours}}{\text{Max. possible hours in budget period}} \times 100 = \frac{8,000}{9,600} \times 100 = 83.33\%$
- (iv) Actual capacity usage ratio =  $\frac{\text{Actual Hours}}{\text{Max. possible working hours in period}} \times 100 = \frac{7,500}{9,600} \times 100 = 78.125\%$
- (v) Actual usage of budgeted capacity ratio =  $\frac{\text{Actual hours}}{\text{Budgeted Days}} \times 100 = \frac{7,500}{8,000} \times 100 = 93.75\%$

# Standard Costing

## MCQs

Q(1). Under standard cost system the cost of the product determined at the beginning of production is its:

- A. Direct cost
- ☒ B. Pre-determined cost
- C. Historical cost
- D. Actual cost

Q(2). The deviations between actual and standard cost is known as:

- A. Multiple analysis
- ☒ C. Variance analysis
- B. Variable cost analysis
- D. Linear trend analysis

Q(3). The standard which is attainable under favourable conditions is:

- ☒ A. Theoretical standard
- B. Expected standard
- C. Normal standard
- D. Basic standard

Q(4). The standard most suitable from cost control point of view is:

- A. Normal standard
- ☒ C. Expected standard
- B. Theoretical standard
- D. Basic standard

Q(5). Overhead cost variance is:

- ☒ A. The difference between overheads recovered on actual output – actual overheads incurred
- B. The difference between budgeted overhead cost and actual overhead cost.
- C. Obtained by multiplying standard overhead absorption rate with the difference between standard hours for actual output and actual hours worked.
- D. None of the above

Q(6). Which of the following variance arises when more than one material is used in the manufacture of a product:

- A. Material price variance
- B. Material usage variance
- C. Material yield variance
- ☒ D. Material mix variance

Q(7). If standard hours for 100 units of output are 400 @ ₹ 2 per hour and actual hours take are 380 @ ₹ 2.25 per, then the labour rate variance is:

- ☒ A. ₹ 95 (adverse)
  - B. ₹ 100 (adverse)
  - C. ₹ 25 (favourable)
  - D. ₹ 120 (adverse)
- $(2 - 2.25) \times 380 = -95 = 95 (A)$

Q(8). Controllable variances are best disposed-off by transferring to:

- A. Cost of goods sold
- B. Cost of goods sold and inventories
- C. Inventories of work-in-progress and finished goods
- ☒ D. Costing profit & loss account

Q(9). Idle time variance is obtained by multiplying:

- A. The difference between standard and actual hours by the actual rate of labour per hour
- ☒ B. The difference between actual labour hours paid and actual labour hours worked by the standard rate
- C. The difference between standard and actual hours by the standard rate of labour per hour
- D. None of the above

Q(10). Basic standards are:

- A. Those standards, which require high degree of efficiency and performance
- B. Average standards and are useful in long term planning
- C. Standards, which can be attained or achieved
- ☒ D. Assuming to remain unchanged for a long time.