1. STANDARD COSTING

Problem 1 E

SUNRISE LTD, a manufacturing Company using Standard costing furnishes the following information:

The standard mix to produce one unit of product A is as under:

Material P 2 kg @ Rs. 20 per kg

Material Q 3 kg @ Rs. 25 per kg

Material R 4 kg @ Rs.15 per kg

During the month of March 2019, 20 units of product A were actually produced and consumption of material was as under:

Material P 35 kg @ Rs.22 per kg

Material Q 60 kg @ Rs. 24 per kg

Material R 90 kg @ Rs.16 per kg

Required:

Calculate the following Material Variances:

(i) **Material Cost Variance**

(ii) **Material Price Variance**

(iii) **Material Quantity Variance**

(iv) **Material Mix Variance**

(v) **Material Yield Variance**

(Calculate upto 2 decimal points.)

Solution:

Statement showing Standard and Actual Material Cost:

	Standard for 20 Units			Actual for 20 Units		
Material	Qty. (Units)	Rate (Rs.)	Amount (Rs.)	Qty. (Units)	Rate (Rs.)	Amount (Rs.)
P	40	20	800	35	22	770
Q	60	25	1,500	60	24	1,440
R	80	15	1,200	90	16	1,440
Total	180		3,500	185		3,650

(i) Material Cost Variance

= Standard Cost (SC) – Actual Cost (AC)

= Rs. 3,500 – Rs. 3,650 = Rs. 150 (A)

(ii) Material Price Variance

= Actual Quantity [Standard Price (SP) – Actual Price (AP)]

Material P = 35 (Rs.20 – Rs. 22) = Rs. 70 (A)

Material Q = 60 (Rs. 25 – Rs.24) = Rs. 60 (F)

Material R = 90 (Rs.15 – Rs.16) = Rs. 90 (A)

= Rs. 100 (A)

(iii) Material Quantity (Usage) Variance

= SP (SQ – AQ) where Q = Quantity

Material P = 20 (Rs.40 – Rs. 35)	= Rs. 100 (F)
Material Q = 25 (Rs. 60 – Rs.60)	= Nil
Material R = 15 (Rs.80 – Rs.90)	=Rs. 150 (A)
	= Rs. 50 (A)

(iv) Material Mix Variance

= SP (Revised SQ- AQ)

Material P = 20 (kgs.41.11 – Rs. 35)	= Rs. 122.20 (F)
Material Q = 25 (kgs. 61.67 – Rs.60)	= Rs. 41.75 (F)
Material R = 15 (kgs.82.22 – Rs.90)	=Rs. 116.70 (A)
	= Rs. 47.25 (F)

Note: Revised Standard Quantity (RSQ) is calculated as follows: Material P = (185/180) ×40 = 41.11 kgs.

Material Q = (185/180) ×60 = 61.67 kgs.

Material R = (185/180) × 80 = 82.22 kgs.

(v) Material Yield Variance

= Standard Cost (Yield Price)per Unit (Actual Yield – Standard Yield)

= Rs. 175 (20 Units– 20.56 Units) = Rs.98 (A)

Note:

(a) Standard Material Cost (Yield Price) per Unit of output

= Rs. 3,500 /20 = Rs. 175

(b) Standard Yield = Actual Usage of Material / Standard Usage per Unit of output

= 185 /9 = 20.56 Units

Problem 2 E

ABC Co. uses a standard cost system and manufactures product Z. Standard cost per 1000 kg of output is as under:

In March 2022, the company produced 2,00,000 kg of output. Actual consumption was:

Material	Quantity (in kg)	Price (in ₹)
A	800	2.50
B	200	4.00
C	200	1.00

Material:

A – 1,57,000 kg @ ₹ 2.40

B – 38,000 kg @ ₹ 4.20

C – 36,000 kg @ ₹ 1.10

Calculate Material cost variance.

Solution:

Standards Material Cost of 2,00,000 kg of output

		Standard Quantity (in kg)	Standard Price (in ₹)	SQ × SP (₹)
A	800 × 200 =	1,60,000	2.50	4,00,000
B	200 × 200 =	40,000	4.00	1,60,000
C	200 × 200 =	40,000	1.00	40,000
		2,40,000		6,00,000

Actual Material Cost of 2,00,000 kg of output

Particulars	AQ (kg)	AP (₹)	AQ × AP (₹)
A	1,57,000	2.40	3,76,800
B	38,000	4.20	1,59,600
C	36,000	1.10	39,600
	2,31,000		5,76,000

Material cost variance = (SQ × SP) – (AQ × AP) = 6,00,000 – 5,76,000 = ₹ 24,000 (F)

Problem 3

Standard Material Cost Per Unit : Material A @ ₹ 1.00, Material B @ ₹ 2.00

Material Issued: Material A = 2050 pieces, Material B = 2980 pieces

Material A was purchased at the rate of ₹1.00 and Material B was purchased at the rate of ₹2.10 Calculate Material Price Variance.

Solution:

The Material Price Variance will be as follows:

Materials price variance = (Standard price – Actual price) × Actual quantity

Material A = (1.00 - 1.00) × 2,050 = Nil

Material B = (2.00 - 2.10) × 2,980 = ₹ 298 (Unfavourable)

Problem 4 E IMP

A product is made from two raw materials, material A and material B. One unit of finished product requires 10 kg of material. The following is standard mix:

Material A	20%	2 kg @	₹ 2.00	= ₹ 4.00
Material B	80%	8 kg @	₹ 1.00	= ₹ 8.00
	100%	10 kg	₹ 1.20	₹ 12.00

During a period one unit of product was produced at the following costs:

Material A	**8 kg @**	**₹ 2.00**	**= ₹ 16.00**
Material B	**4 kg @**	**₹ 1.25**	**= ₹ 15.00**
	12 kg	**₹ 1.75**	**₹ 21.00**

Compute the materials mix variance.

Solution:

Materials mix variance = (Revised standard proportion of actual input – Actual proportion) × Standard price

Revised standard proportion: $\frac{Standard\ proportion\ of\ a\ particular\ mix}{Total\ Standard\ Quantity}$ X Actual input

Revised standard proportion:

Material A = $\frac{2}{10}$ X 12 = 2.40 kg

Material B = $\frac{8}{10}$ X 12 = 9.60 kg

Materials mix variance:

Material A = (2.40 kg – 8 kg) × 2.00

= (– 5.60)× 2.00 = ₹ 11.20

(Unfavorable)

Material B = (9.60 kg – 4 kg) × 1.00

= 5.60 × 1.00 = ₹ 5.60 (Favorable)

Total mix variance = ₹ 5.60 (Unfavorable)

Problem 5

The details regarding the composition and the weekly wage rates of labour force engaged on a job scheduled to be completed in 30 weeks are as follows:

Category of Workers	Standard		Actual	
	No. of Workers	Weekly Wage Rate per worker	No. of Workers	Weekly Wage Rate per worker
Skilled	75	60	70	70
Semi-skilled	45	40	30	50
Unskilled	60	30	80	20

The work is actually completed in 32 weeks.

Calculate the following Labour Variances:

(i) Labour Cost Variance;

(ii) Labour Rate variance;

(iv) Labour Efficiency Variance;

(v) Labour Revised Efficiency Variance;

(vi) Labour Mix Variance.

Solution:

Computation of Standard and Actual Time

Category	Standard Time (ST)	Actual Time (AT)

Skilled	75x30 = 2,250	70 x 32 = 2,240
Semiskilled	45 x30= 1,350	30x32 = 960
Unskilled	60x30 = 1,800	80x32 = 2,560

Computation of Standard Cost and Actual Cost

Category of Worker	Standard			Actual			Revised Time RST
	Time ST	Rate SR (Rs.)	Cost SC(Rs.)	Time AT	Rate AR(Rs.)	Cost AC(Rs.)	
Skilled	2,250	60	1,35,000	2,240	70	1,56,800	2,400
Semiskilled	1,350	40	54,000	960	50	48,000	1,440
Unskilled	1800	30	54,000	2,560	20	51,200	1,920
Total	5,400	-	2,43,000	5,760	-	2,56,000	5,760

Computation of Revised Standard Time (RST)

Skilled worker : $\frac{2,250}{5,400} \times 5,760 = 2,400\ Hours$

Semi - Skilled worker : $\frac{1,350}{5,400} \times 5,760 = 1,400\ Hours$

Un Skilled worker : $\frac{1,800}{5,400} \times 5,760 = 1,920\ Hours$

Computation of Variances

(i) LCV (Labour Cost Variance) = TSC - TAC = 2,43,000 - 2,56,000 = Rs. 13,000 (A)

(ii) LRV (Labour Rate Variance) = AT(SR-AR)

Skilled Worker : 2,240 (60 – 70) = Rs. 22,400 (A)

Semiskilled Worker :960 (40 – 50) = Rs. 9,600 (A)

Unskilled Worker : 2,560 (30 – 20) = Rs. 25,600 (F) = Rs. 6,400 (A)

(iii) LEV (Labour Efficiency Variance) = SR(ST-AT)

Skilled Worker : 60 (2,250 – 2,240) = Rs.600 (F)

Semiskilled Worker : 40(1,350 – 960) = Rs. 15,600 (F)

Unskilled Worker : 30(1,800 – 2,560) = Rs. 22,800 (A) = Rs. 6,600 (A)

(iv) LREV (Labour Revised Efficiency Variance) = SR (ST – RST)

Skilled Worker : 60(2,250 – 2,400) = Rs. 9,000 (A)

Semiskilled Worker : 40(1,350 – 1,440) = Rs. 3,600 (A)

Unskilled Worker : 30(1,800 – 1,920) = Rs. 3,600 (A) = Rs. 16,200 (A)

(v) LMV (Labour Mix Variance) = SR (RST – AT)

Skilled Worker : 60(2,400 – 2,240) = Rs. 9,600 (F)

Semiskilled Worker : 40(1,440 – 960) = Rs. 19,200 (F)

Unskilled Worker : 30(1,920 – 2,560) = Rs. 19,200 (A) = Rs. 9,600 (F)

Problem 6

Actual hours 5,800

Actual direct wages ₹1,800

Standard rate per hour ₹0.35

Standard hours 6,000

Solution:

Labour cost variances =Std. Wage - Actual Wage =(6000 × 0.35) - 1800= 2100 - 1800 = ₹300 (F)

Problem 7

Actual hours 5,800

Actual direct wages ₹1,800

Standard rate per hour ₹0.35

Standard hours 6,000

Solution:

Labour rate variance = AH (SR - AR) = 5800 (0.35 - 0.31) = ₹232 (F)

Problem 8

Following are the data obtained from the books of a manufacturing company with respect to variable overheads:

Budgeted production: 600 units.

Budgeted variable overhead: ₹15,600.

Standard time for 1 unit: 20 hours.

Actual production: 500 units

Actual hours worked: 9,000 hrs.

Actual variable overhead: ₹14,000.

Compute Variable Overhead Cost Variance

Solution:

Step 1: Computation of standard variable cost per unit.

i. Standard variable cost per unit = $\frac{Budget\ Variable\ overhead}{Budgeted\ Production}$

= $\frac{15,600}{600\ units}$: ₹ 26 per unit

Step 2: Computation of standard-variable overhead cost of the actual output

= Actual production × Std. variable cost/unit

= 500 units × ₹26 = ₹13,000.

(a) Calculations of variable-overhead variance:

Variable-overhead variance = Standard cost – Actual cost.

ii. Substituting the values, we get

(₹ 13,000 – ₹ 14,000) = ₹ 1,000 (A).

Variable Overhead Cost Variance = ₹1,000 (A)

Problem 9

Compute Variable Overhead Efficiency Variance from the following data:

Budgeted production: 2,000 units.
Actual production: 1,500 units.
Budgeted variable overhead: ₹4,000.
Actual variable overhead: ₹2,500.
Standard hours per unit: 1 hour.
Actual hours worked: 1,800 hrs.

Solution:

Step 1: Calculation of the actual output in terms of std. hours:

= Actual output × Std. hrs, per unit
= 1,500 units × 1 hour
= 1,500 hours

Step 2: Calculation of variable-overhead-efficiency variance:

(i) Write the formula:

Variable Overhead Efficiency Variance = Standard Variable Overhead Rate / hour (Actual output in terms of std. hrs – Actual hours worked).

(ii) Substituting the values, we get

Variable Overhead Efficiency Variance = ₹ 2 (1,500 hrs – 1,800 hrs)
= ₹ 2 (–300 hrs)
= ₹ 600 (A).

Problem 10

The following details are available for ABC LTD. A manufacturing company:

	Budgeted Expenses, units & hrs.	Actual Expenses, units & hrs.
Variable Overheads (₹)	5,00,000	5,20,000
Output in units	50,000	40,000
Working hours	2,50,000	2,20,000

You are Required to Calculate the following variances:

(i) Variable Overhead Expenditure Variance
(ii) Variable Overhead Efficiency Variance
(iii) Total Variable Overhead Variance

Solution:

Standard Variable Overhead per unit ₹ 5,00,000/50,000 = ₹ 10
Standard Variable Overhead per hour 5,00,000/2,50,000 = ₹ 2
Time allowed per unit of output = 2,50,000/50,000 = 5 hours

(a) Variable Overhead Expenditure Variance = AH × SR - AOVH
= (2,20,000 × 2) - 5,20,000
= ₹ 80,000 Adverse

(b) Variable Overhead Efficiency Variance = {standard time for actual production (2,00,000 hrs) × SR per hour (2)} - {Actual hrs (2,20,000) × SR per hour (2)} = ₹

40,000 Adverse.

(c) Total Variable Overhead Variance = Actual output (40,000) × SR-per unit (10)- Actual Overhead (5,20,000) = 1,20,000 Adverse.

Problem 11

M/s gems limited provided you the following data for the month of march, 2023.

Particulars	Standard	Actual
Fixed overhead	₹ 30,000	₹ 35,000
Units produced	1,000	1,200
Hours per unit	1	1.1
No. of days	20	23

You are required to calculate the following fixed overhead variances:

(i) Efficiency variance
(ii) Capacity variance
(iii) Idle time variance
(iv) Volume variance
(v) Budget/expenditure variance
(vi) Fixed overhead cost variance

Solution:

(i)	Efficiency Variance =	₹ 3600 (A)
(ii)	Capacity Variance =	D 5100 (F)
(iii)	Idle Time variance =	D 4500 (F)
(iv)	Volume Variance =	D 6000 (F)
(v)	Budget / Expenditure Variance =	₹ 5000 (A)
(vi)	Fixed Overhead Cost Variance =	₹ 1000 (F)

Problem 12

WESTLAND LTD., a manufacturing company, operates standard costing system and showed the following data in respect of the month of May 2019:

Budgeted		Actual	
Working days	20	Working days	22
Man hours	4000	Man hours	4200
Fixed overhead cost (₹)	2400	Fixed overhead cost (₹)	2500
Output (units)	800	Output (units)	900

You are required to calculate the following Fixed overheads variances:

(i) FOH Budget Variance
(ii) FOH Cost Variance
(iii) FOH Efficiency Variance
(iv) FOH Capacity Variance

(v) FOH Calendar Variance

(vi) FOH Volume Variance

Solution:

SR = $\frac{\text{Budgeted FOH}}{\text{Budgeted Hours}} = \frac{\mathbf{2400}}{\mathbf{4000}} = \mathbf{0.60}(₹)$

Standard man hours er unit = $\frac{4000}{800} = 5$

Standard hours for Actual Output = 900 × 5= 4500

Revised budgeted hours = $\left(\frac{22}{20} \times 4000\right) = 4400$

SRSH (₹) (1)	SRAH (₹) (2)	RBH5R (₹) (3)	SRBH (₹) (4)	ARAH (₹) (5)
0.6x4500 = 2,700	0.6x4200 = 2,520	0.6x4400 = 2,640	0.6x4000 = 2,400	2,500

Fixed overhead Variances:

(i)	FOH Budget Variance	= (4)-(5)=₹ 100(A)
(ii)	FOH Cost Variance	= (1)-(5)=₹ 200 (F)
(iii)	FOH Efficiency Variance	= (1)-(2)=₹ 180 (F)
(iv)	FOH Capacity Variance	= (2)-(3)=₹ 120 (A)
(v)	FOH Calendar Variance	= (3)-(4)=₹ 240 (F)
(vi)	FOH Volume Variance	= (1)-(4)=₹ 300 (F)

Problem 13

AB Ltd. has furnished the following information:

	Budgeted	Actual (July 2022)
Number of Working Days	25	27
Production (in units)	20,000	22,000
Fixed Overheads	₹30,000	₹ 31,000

Budgeted fixed overhead rate is ₹ 1.00 per hour. In July 2022, the actual hours worked were 31,500. In relation to fixed overheads, calculate:

i. **Efficiency Variance**
ii. **Capacity Variance**
iii. **Calendar Variance**
iv. **Volume Variance**
v. **Expenditure Variance**

Solution:

Standard rate per unit (Budgeted overheads/Budgeted output) i.e., = (₹30,000/20,000 units) = ₹ 1.50

Standard time per unit (30,000/20,000) = 1.50 hours

(i) Efficiency Variance = Standard overhead rate (Standard hours for actual output – Actual hours worked)

₹1.00 (33,000 – 31,500) = ₹ 1,500 (F)

Standard hour for actual output = 22,000 units @ 1.5 hours = 33,000 hours.

(ii) Capacity Variance = Standard rate per hour (Actual hours worked – Budgeted hours for 27 days)

₹1 (31,500 – 32,400) = ₹ 900 (A)

Budgeted hrs for 25 days = 30,000 therefore, budgeted hours for 27 days = 32,400 i.e., (30,000÷25 ×27)

(iii) Calendar Variance

Standard Overheads rate per day (Actual working days – Budgeted working days)

₹1,200× (27 – 25) = ₹ 2,400 (F), where, Standard Overheads rate per day = ₹30,000÷25 days = ₹1,200

(iv) Volume Variance

Standard rate per unit (Actual Output – Budgeted output)

₹ 1.50 × (22,000 – 20,000) = ₹ 3,000 (F).

(v) Expenditure Variance

Budgeted overheads – Actual overheads

₹ 30,000 – ₹ 31,000 = ₹1,000 (A).

Problem 14 E

SHIBHUMA LTD., budgets to sell in the quarter ending March 31, 2019:

500 Units of product P @ ₹ 30 per unit,

400 Units of product Q @ ₹ 20 per unit and

100 Units of product R @ ₹ 50 per unit.

During the quarter Actual Sales were as follows:

400 Units of product P @ ₹40 per unit.

500 Units of product Q @ ₹10 per unit.

50 Units of product R @ ₹40 per unit.

You are required to determine the following sales variances:

(i) Sales Value variance

(ii) Sales Price Variance

(iii) Sales Volume Variance

(iv) Sales Mix Variance

(v) Sales Sub-Volume Variance

Solution:

Product	AQAP (₹) (1)	AQSP (₹) (2)	RSQSR (₹) (3)	SQSP (₹) (4)
P	400×40 =16,000	400×30 =12,000	475×30 =14,250	500×30 =15,000
Q	500×10 =5,000	500×20 =10,000	380×20 =7,600	400×20 =8,000
R	50×40 =2,000	50×50 =2,500	95×50 =4,750	100×50 =5,000

	23,000	24,500	26,600	28,000

RSQ = $\frac{SQ\ for\ thsat\ product}{SQ\ for\ all\ products} \times AQ\ for\ all\ products$

P = $\frac{5}{10} \times 950 = 475$

Q = $\frac{4}{10} \times 950 = 380$

R = $\frac{1}{10} \times 950 = 95$

(i) Sales Value Variance = (1-4) = ₹ 5,000 (Adverse)

(ii) Sales Price Variance = (1-2) = ₹ 1,500 (Adverse)

(iii) Sales Volume Variance = (2-4) = ₹ 3,500 (Adverse)

(iv) Sales Mix Variance = (2-3) = ₹ 2,100 (Adverse)

(v) Sales Sub Volume Variance = (3-4) = ₹ 1,400 (Adverse)

Problem 15 E IMP

Budgeted Sales

Product	Units Sold	Selling Price Per Unit (₹)	Standard Margin (Profit Per Unit (₹)
A	1,000	15	8
B	1,000	10	5
C	1,000	8	2

Actual Sales

A	800 units for ₹ 9,600
B	1,200 units for ₹ 10,800
C	1,500 units for ₹ 13,500

Calculate: (i) Actual Profit per unit, (ii) Sales Margin Volume Variance.

Solution:

Basic Calculations:

(i) Actual profit per unit is calculated as follows:

For Product A : Actual selling price per unit – (Budgeted selling price per unit – Standard profit per unit)

$= \frac{₹\ 9,600}{800\ units} = ₹12 - (₹15 - ₹8)$

$= ₹\ 12 - (7) = ₹\ 5$

For product B $= \frac{₹\ 10,800}{1,200\ units} - (₹10 - ₹\ 5)$

$= ₹\ 9 - (₹5) = ₹4$

For product C $= \frac{₹\ 13,500}{1,500\ units} - (₹\ 8 - ₹2)$

$= ₹\ 9 - (₹6) = ₹\ 3.$

Sales Margin Volume Variance= Standard Profit per unit ×(Budgeted Quantity of Sales - Actual Quantity of Sales).

(ii) Substituting the values, we get:

For Product A = ₹ 8 (1,000 units – 800 units) = ₹ 1,600 (A)
Product B = ₹ 5 (1,000 units – 1,200 units) = ₹ 1,000 (F)
Product C = ₹ 2 (1,000 units – 1,500 units) = ₹ 1,000 (F)
Total = ₹ 400 (F)

Problem 16 E IMP

XYZ & Co. manufactures and sells three products. It provides the following data for the month of September:

Budgeted Sales

Product	Units Sold (Units)	Selling Price Per Unit (₹)	Standard Margin (Profit Per Unit ₹)
A	1,500	15	8
B	1,500	10	5
C	1,500	8	2

Actual Sales

A	1,100 units for ₹ 14,300
B	1,900 units for ₹ 17,100
C	3,000 units for ₹ 27,000

Calculate of Sales-price Variance.

Solution:

i. Sales Price Variance = Actual Quantity sold × (Standard Price - Actual Price)

ii. Substituting the values, we get:

Product A: 1,100 units (₹15 – ₹13) = 1,100 × 2 = ₹2,200 (A)
Product B: 1,900 units (₹10 – ₹9) = 1,900 × 1 = ₹1,900 (A)
Product C: 3,000 units (₹8 – ₹9) = 3,000 × 1 = ₹3,000 (F)
Sales price variance (Total) = ₹1,100 (A)

Problem 17 E

The sales manager of a company that produces and sells three products A, B and C, provides you the following information for the month of August:

Budgeted Sales

Product	Units Sold	Selling Price Per Unit (₹)	Standard Margin (Profit Per Unit ₹)
A	1,000	15	8
B	1,000	10	5
C	1,000	8	2

Actual Sales

A	800 units for ₹ 9,600
B	1,200 units for ₹ 10,800

C	1,500 units for ₹ 13,500

Calculate: (i) Actual Profit per unit, (ii) Sales Margin Price Variance.

Solution:

Basic Calculations:

(i) Actual profit per unit is calculated as follows:

For Product A: Actual selling price per unit – (Budgeted selling price per unit – Standard profit per unit)

$= \frac{₹\ 9,600}{800\ units}$ = ₹ 12 – (₹ 15 - ₹8)

= ₹ 12 – (7)

= ₹ 5

For Product B = $\frac{₹\ 10,800}{1,200\ units}$ – (₹ 10 - ₹ 5)

= ₹ 9 – (₹ 5)

= ₹ 4

For Product C = $\frac{₹\ 13,500}{1,500\ units}$ – (₹ 8 - ₹ 2)

= ₹ 9 – (₹ 6)

= ₹ 3

Calculation of Sales-Price Variance:

(ii) Sales Margin Price Variance = Actual Quantity of Sales ×(Standard Profit per unit – Actual Profit per unit).

Substituting the values for each product, we get

Product A = 800 units (₹ 8 – ₹ 5)	= ₹ 2,400 (A)
Product B = 1,200 units (₹ 5 – ₹ 4)	= ₹ 1,200 (A)
Product C = 1,500 units (₹ 2 – ₹ 3)	= ₹ 1,500 (F)
Total	= ₹ 2,100 (A)

Problem 18 E

Calculate Sales-mix variance:

Budgeted Sales

Product	Units Sold (Units)	Selling Price Per Unit (₹)	Standard Margin (Profit Per Unit ₹)
A	1,500	15	8
B	1,500	10	5
C	1,500	8	2

Actual Sales

A	1,100 units for ₹ 14,300
B	1,900 units for ₹ 17,100
C	3,000 units for ₹ 27,000

Calculate Sales-mix Variance.

Solution:

Sales Mix variance = Standard Price X (Revised Standard Quantity – Actual Quantity)

i. Std value of actual mix is to be calculated as follows:

Product A: 1,100 units X ₹ 15 = ₹ 16.500

Product B: 1,900 units X ₹ 10 = ₹ 19.000

Product C: 3,000 units X ₹8 = ₹ 24,000

₹ 59,500

ii. Revised mix is to be calculated as follows:

Product A: $\frac{6{,}000\ units\ X\ 1{,}500\ units}{4{,}500\ units}$ = 2,000 units

Product B: $\frac{6{,}000\ units\ X\ 1{,}500\ units}{4{,}500\ units}$ = 2,000 units

Product C: $\frac{6{,}000\ units\ X\ 1{,}500\ units}{4{,}500\ units}$ = 2,000 units

iii. Std. Value of revised std mix is calculated as:

Product A: 2,000 units X ₹15 = ₹ 30,000

Product B: 2,000 units X ₹10 = ₹ 20,000

Product C: 2,000 units X ₹ 8 = ₹ 16,000

₹ 66,000

iv. Now, substituting the values in the formula, we get sales-mix variance = (₹59,500 - ₹66,000) = ₹6,500 (A)

2. BUDGETRY

Problem 1 E

Draw up a flexible budget for overhead expenses on the basis of the following data and determine the overhead rates at 70%, 80% and 90%:

Plant Capacity	At 80% capacity (₹)
Variable Overheads:	
Indirect labour	12,000
Stores including spares	4,000
Semi Variable:	
Power (30% - Fixed; 70% -Variable)	20,000
Repairs (60%- Fixed; 40% -Variable)	2,000
Fixed Overheads:	
Depreciation	11,000
Insurance	3,000
Salaries	10,000
Total overheads	62,000
Estimated Direct Labour Hours	1,24,000

Solution:

Flexible Budget at Different Capacities and Determination of Overhead Rates

Particulars	70% (₹)	80% (₹)	90% (₹)
(A) Variable overheads:			
Indirect labour	10,500	12,000	13,500
Stores including spares	3,500	4,000	4,500
Total (A)	14,000	16,000	18,000
(B) Semi Variable overheads:			
Power (Working Note)	18,250	20,000	21,750
Repairs (Working Note)	1,900	2,000	2,100
Total (B)	20,150	22,000	23,850
(C) Fixed overheads:			
Depreciation	11,000	11,000	11,000
Insurance	3,000	3,000	3,000
Salaries	10,000	10,000	10,000
Total (C)	24,000	24,000	24,000
Grand Total (A+B+C)	58,150	62,000	65,850
Labour Hours	$1,24,000 \times \frac{70\%}{80\%} = 1,08,500$	1,24,000	$1,24,000 \times \frac{90\%}{80\%} = 1,39,500$
Overhead rate per hour (₹)	$\frac{58,150}{1,08,500} = 0.472$	$\frac{62,850}{1,24,500} = 0.50$	$\frac{65,850}{1,39,500} = 0.472$

Working notes: Semi Variable overheads

	70%	90%
Power:		
Variable (70%)	$14,000 \times \frac{70\%}{80\%} = 12,250$	$14,000 \times \frac{90\%}{80\%} = 15,750$
Fixed (30%)	6,000	6,000
Total	18,250	21,750
Repairs:		
Variable (40%)	$800 \times \frac{70\%}{80\%} = 700$	$800 \times \frac{90\%}{80\%} = 900$
Fixed (60%)	1,200	1,200
Total	1,900	2,100

Problem 2

Following are the budgeted expenses for production of an electronic component of TV (10,000 units):

Particulars	₹
Direct materials	50
Direct labour	20

Variable overheads	20
Fixed overheads (₹ 1,00,000)	10
Variable expenses (Direct)	5
Selling expenses (10% fixed)	10
Distribution expenses (20% fixed)	5
Administration expenses (₹ 50,000)	5
Total cost of sale per unit (to make and sell)	125

Prepare a budget for production of (a) 7,000 units and (b) 9,000 units, showing distinctly marginal cost and total cost. Assume that the administration expenses are rigid for all levels of production.

Solution:

NOTE: 1. Fixed and variable elements have to be segregated as follows:

(a) For selling expenses:

(i) Fixed: 10% of ₹10 = ₹ 1.

For 10,000 units = 10,000 × ₹ 1 = ₹10,000.

(ii) Variable: (₹ 10 – ₹ 1) = ₹ 9 per unit.

(b) For distribution expenses:

(i) Fixed: 20% of ₹ 5 = ₹ 1.

For 10,000 unit = 10,000 x ₹ 1= ₹10,000.

(ii) Variable = (₹ 5 – ₹ 1) ₹ 4 per unit

(c) For the other items, the respective given information has to be taken into account.

(d) Marginal costs and total costs have to be compared by preparing flexible budgets as follows:

Particulars	7,000 units		9000 units	
	Per unit (₹)	Total (₹)	Per unit (₹)	Total (₹)
Step 1: Prime cost:				
(i) Direct materials	50	3,50,000	50	4,50,000
(ii) Direct labour	20	1,40,000	20	1,80,000
(iii) Direct expenses	5	35,000	5	45,000
	75	5,25,000	75	6,75,000
Step 2: Variable overheads				
(i) General	20	1,40,000	20	1,80,000
(ii) Selling* [Note 1(a)]	9	63,000	9	81,000
(iii) Distribution [Note 1(b)]	4	28,000	4	36,000
	33	2,31,000	33	2,97,000
Step 3: Fixed overheads:				
(i) General	14.29	1,00,000	11.11	1,00,000
(ii) Administration	7.14	50,000	5.55	50,000
(iii) Selling	1.42	10,000	1.11	10,000
(iv) Distribution	1.42	10,000	1.11	10,000

	24.27	1,70,000	18.88	1,70,000
Step 4: Marginal costs (Step 1 + Step 2)	108	7,56,000	108	9,72,000
Step 5: Total cost (Step 3 + Step 4)	132.27	9,26,000	126.88	11,42,000

Problem 3 E

Production Budget

From the following information, prepare a production budget for ABC Co. Ltd assuming that

(a) There is no loss in production

(b) Normal loss in production – 5% and 10% for products X and Y, respectively.

(c) Information:

	Sales Budget (units)	Product X	Product Y
1.	Division I	2,000	1,000
	Division II	3,000	6,000
	Division III	2,500	2,250
	Total units	7,500	9,250
2.	Stock as on 1 January:		
	X – 1,500		
	Y – 2,000		
3.	Stock on 31 December: Estimated to be 10% more in quantity		

Solution:

Total number of units to be produced is to be found out in the same manner as discussed in the previousillustration

Production Budget Period:

Product (1)	Sales Budget (2)	Desired Closing Stock 31 December (3)	Opening Stock 1 January (4)	Units to be Produced (2) + (3) – (4) = (5)
X	7,500	1,500 + 10% = 1,650	1,500	7,650
Y	9,250	2,000 + 10% = 2,200	2,000	9,450

(a) When there is no loss in production

Units to be produced: X = 7,650 units & Y = 9,450 units.

(b) When there is loss in production:

X = 5% loss : units to be produced: $7{,}650 \times \frac{100}{95} = 8052.6\ units.$

Y = 10% loss : units to be produced: $9{,}450 \times \frac{100}{90} = 10{,}500\ units.$

Problem 4 E

Prepare a Cash Budget for the three months ending 30th June, 2022 from the information given below:

(a)

Month	Sales (₹)	Materials (₹)	Wages (₹)	Overheads (₹)
February	14,000	9,600	3,000	1,700
March	15,000	9,000	3,000	1,900
April	16,000	9,200	3,200	2,000
May	17,000	10,000	3,600	2,200
June	18,000	10,400	4,000	2,300

(b) Credit terms are:

Sales/debtors: 10% sales are on cash, 50% of the credit sales are collected next month and the balance in the following month.

Creditors: Materials 2 months

Wages 1/4 in the following month

Overheads 1/2 in the following month.

(c) Cash and bank balance on 1st April, 2022 is expected to be ₹ 6,000.

(d) other relevant information are:

(i) Plant and machinery will be installed in February 2022 at a cost of ₹ 96,000. The monthly instalment of ₹ 2,000 is payable from April onwards.

(ii) Dividend @ 5% on preference share capital of ₹ 2,00,000 will be paid on 1st June.

(iii) Advance to be received for sale of vehicles ₹ 9,000 in June.

(iv) Dividends from investments amounting to ₹1,000 are expected to be received in June.

Solution:

Cash Budget for the 3 Months Ending 30th June 2022 **(Amount in ₹)**

Particulars	April	May	June
Opening Balance (A)	6,000	3,950	3,000
Add: Receipts: (B)			
Cash Sales	1,600	1,700	1,800
Collection from debtors [see note(i)]	13,050	13,950	14,850
Advance for sale of vehicles	-	-	9,000
Dividends from Investments	-	-	1,000
Total (A+B)	20,650	19,600	29,650
Less Payments:			
Materials	9,600	9,000	9,200
Wages [see note (ii)]	3,150	3,500	3,900

Overheads	1,950	2,100	2,250
Instalment of Plant & Machinery	2,000	2,000	2,000
Preference dividend	-	-	10,000
Total (C)	16,700	16,600	27,350
Closing Balance (A+B-C)	3,950	3,000	2,300

Working Notes:

(i) Computation of Collection from Debtors **(Amount in ₹)**

Month	Total Sales	Credit Sales	Feb	Mar	Apr	May	June
Feb	14,000	12,600	---	6,300	6,300	---	---
Mar	15,000	13,500	---	---	6,750	6,750	---
Apr	16,000	14,400	---	---	---	7,200	7,200
May	17,000	15,300	---	---	---	---	7,650
					13,050	13,950	14,850

(ii) Wages payment in each month is to be taken as three-fourths of the current month plus one-fourth of the previous month.

Problem 5

When the financial controller of Better Company set the budget for the year ahead, it was expected that monthly output of cake packages would be 12,000 units. In March the output was increased to 14,000 per month following negotiation with a chain of corner shops. The following table reports the original budget and the actual outcome for the month of March.

Particulars	Original Budget	Actual for March
	Amount (₹)	Amount (₹)
Cake packages output (units)	12,000	14,000
Direct materials	48,000	53,000
Direct labour	24,000	29,000
Variable overhead	6,000	7,200
Fixed overhead	4,000	4,500
Total production costs	82,000	93,700

Financial Controller wants to report about the impact of the above and requested you as a Management Accountant of the company to give a detailed report on these.

Solution:

The report should contain the following:

Particulars	Original budget	Flexible budget	Actual for March	Variance
	(1)	(2)	(3)	(2) – (3)

Units manufactured	12,000	14,000	14,000	
	₹	₹	₹	₹
Direct materials	48,000	56,000	53,000	3,000 (F)
Direct labour	24,000	28,000	29,000	1,000 (A)
Variable overhead	6,000	7,000	7,200	200 (A)
Fixed overhead	4,000	4,000	4,500	500 (A)
Total costs	82,000	95,000	93,700	1,300 (F)

The direct materials variance is 5.4% of the flexible budget amount and needs investigating even although it is favorable.

Two possible questions to investigate are:

(1) Did the budget estimates use outdated prices?

(2) Has the buying department chosen low price materials without perhaps considering the quality?

The labour variance is 3.6% of the flexible budget amount. Questions that could be asked here are:

(1) Has there been a rise in pay rates since the budget was set?

(2) Has the apparent purchase of lower cost materials had an impact on labour through using poorer quality materials?

The variable overhead and fixed overhead variances are lower percentages of the flexible budget, but the reasons should be noted to ensure that the variances do not increase in future periods.

Problem 6 E

Prepare the Sales Budget from the following data:

Product	January	February
X	1200 units	1800 units
Y	3600 units	5400 units

The sales area A and B account for 60% and 40% sale of product X and 30% and 70% sale of product Y respectively. The selling price per unit of product X: ₹ 24 and the selling price per unit of product Y: ₹ 30 in both the sales areas.

Solution:

Sales Budget for January

Product	Area	Units ₹	Amount (₹)	Amount (₹)
X	A	(@60%) 720	24	17,280
	B	(@40%) 480	24	11,520
Total		1,200		28,800
Y	A	(@30%) 1,080	30	32,400
	B	(@70%) 2,520	30	75,600
Total		3,600		1,08,000

Sales Budget for February

Product	Area	Units ₹	Amount (₹)	Amount (₹)
X	A	(@60%) 1,080	24	25,920
	B	(@40%) 720	24	17,280
Total		**1,800**		**43,200**
Y	A	(@30%) 1,620	30	48,600
	B	(@70%) 3,780	30	1,13,400
Total		**5,400**		**1,62,000**

Total Sales Budget

Product	Area	Units ₹	Amount (₹)	Amount (₹)
X	A	1,800	24	43,200
	B	1,200	24	28,800
Total		**3,000**		**72,000**
Y	A	2,700	30	81,000
	B	6,300	30	1,89,400
Total		**9,000**		**2,70,000**

Problem 7

Production costs of a factory for a year as follows:

Particulars	Amount (₹)
Direct Wages	80,000
Direct Materials	1,20,000
Production Overheads: Fixed	40,000
Variable	60,000

During the forthcoming year it is anticipated that:

a. **The average rate for direct labour remuneration will fall from ₹ 0.80 per hour to ₹ 0.75 per hour.**

b. **Production efficiency will be reduced by 5%**

c. **Price per unit of direct material and of other materials and services which comprise overheads will remain unchanged, and**

d. **Production in the coming year will increase by 33.33% Draw up a production cost budget.**

Solution:

Production Cost Budget for the Forthcoming Year

Particulars	Amount (₹)
(i) Wages [80,000 × 133.33% × (0.75 ÷ 0.80) × (100 ÷ 95)]	1,05,263
(ii) Materials (1,20,000 × 133.33%)	1,60,000

(iii) Variable Overheads (60,000 × 133.33%)	80,000
(iv) Fixed Overheads	40,000
Production cost	3,85,263

Problem 8 E

You are required to prepare a selling overhead Budget from the estimates given below:

Particulars	(₹)
Advertisement	**1,000**
Salaries of the Sales dept.	**1,000**
Expenses of the Sales dept.(Fixed)	**750**
Salesmen's remuneration	**3,000**

Salesmen's and dearness Allowance - Commission @ 1% on sales excluding Agent's sales.

Carriage outwards: estimated @ 5% on sales.

Agents Commission: 7½ % on Agent's sales.

The sales during the period were estimated as follows:

(a) ₹80,000 including Agent's Sales ₹8,000

(b) ₹90,000 including Agent's Sales ₹10,000

(c) ₹1,00,000 including Agent's Sales ₹10,500

Solution:

Selling Overhead Budget

Sales	₹ 80,000	₹ 90,000	₹ 1,00,000
(A) Fixed overhead:			
Advertisement	1,000	1,000	1,000
Salaries of the sales dept.	1,000	1,000	1,000
Expenses of the sales dept.	750	750	750
Salesmen remuneration	3,000	3,000	3,000
Total (A)	**5,750**	**5,750**	**5,750**
(B) Variable overhead:			
Salesmen's Commission & DA	(72,000 × 1%) = 720	(80,000 × 1%) = 800	(89,500 × 1 %) = 895
Carriage outwards	4,000	4,500	5,000
Agent's Commission	(8,000 × 7.5%) = 600	(10,000 × 7.5%) = 750	(10,500 × 7.5%) = 788
Total (B)	**5,320**	**6,050**	**6,683**
Grand Total (A + B)	**11,070**	**11,800**	**12,433**

Problem 9

P.C.T. Ltd. provides you the following figures for the year 2021:

Particulars		Product A	Product B
Sales (in units):	1st Quarter	1,250	1,600
	2nd Quarter	2,950	800
	3rd Quarter	2,700	1,000
	4th Quarter	3,100	600
Selling price per unit		₹ 24	₹ 50
Targets for 2022:			
Sales quantity increase (decrease)		(20%)	25%
Selling price increase (decrease)		25%	(20%)

Sales area X, Y and Z respectively produce 10%, 20%, 70% of Product 'A' sales and 70%, 20% and 10% of Product 'B' sales.

Required: Prepare Sales Budget for the year 2022.

Solution

Sales Budget (Product - wise) for the year 2022

Product / Period	Product A			Product B		
	Units	Rate (₹)	Amount (₹)	Units	Rate (₹)	Amount (₹)
1st Quarter	1,000	30	30,000	2,000	40	80,000
2nd Quarter	2,360	30	70,800	1,000	40	40,000
3rd Quarter	2,160	30	64,800	1,250	40	50,000
4th Quarter	2,480	30	74,400	750	40	30,000
Total	**8,000**		**2,40,000**	**5,000**		**2,00,000**

Sales Budget (Area-wise) for the year 2022

	Product A				Product B			
Product & Area / Period	X 10% (₹)	Y 20% (₹)	Z 70% (₹)	Total (₹)	X 70% (₹)	Y 20% (₹)	Z 10% (₹)	Total (₹)
1st Quarter	3,000	6,000	21,000	30,000	56,000	16,000	8,000	80,000
2nd Quarter	7,080	14,160	49,560	70,800	28,000	8,000	4,000	40,000
3rd Quarter	6,480	12,960	45,360	64,800	35,000	10,000	5,000	50,000
4th Quarter	7,440	14,880	52,080	74,400	21,000	6,000	3,000	30,000
Total	**24,000**	**48,000**	**1,68,000**	**2,40,000**	**1,40,000**	**40,000**	**20,000**	**2,00,000**

3. DECISION THEORY

Problem 1 E IMP

Julien Point School (JPS) is preparing a summer camp in the jungles of Bagora,

District of Darjeeling to train individuals in wilderness survival. JPS estimates that attendance can fall into one of four categories: 200, 250, 300, and 350 persons. The cost of the camp will be the smallest when its size meets the demand exactly. Deviations above or below the ideal demand levels incur additional costs resulting from constructing more capacity than needed or losing income opportunities when the demand is not met. Letting a_1 to a_4 represent the sizes of the camp (200, 250, 300, and 350 persons) and s_1 to s_4 the level of attendance, the following table summarizes the cost matrix (in thousands of Rupees) for the situation:

	s_1	s_2	s_3	s_4
a_1	5	10	18	25
a_2	8	7	12	23
a_3	21	18	12	21
a_4	30	22	19	15

State the best alternative using: (i) Minimax, (ii) Laplace, (iii) Savage Criterion (Minimax Regret), (iv) Hurwicz Criterion.

Solution:

The problem is analyzed using the following:

i. The Minimax Criterion

	s_1	s_2	s_3	s_4	Row Max
a_1	5	10	18	25	25
a_2	8	7	12	23	23
a_3	21	18	12	21	**21**
a_4	30	22	19	15	30

❖ Minimax

ii. The Laplace Criterion

Assume equal probabilities (1/4) as there are four states of nature.

	s_1	s_2	s_3	s_4	EV= $\Sigma P(X_i) \times X_i$	Figures in ₹ thousand
a_1	5	10	18	25	1/4 (5+10+18+25)=14.5	₹ 14,500
a_2	8	7	12	23	1/4 (8+7+12+23) =12.5	**₹ 12,500**
a_3	21	18	12	21	1/4 (21+18+12+21) =18.0	₹ 18,000
a_4	30	22	19	15	1/4 (30+22+19+15) =21.5	₹ 21,500

Since it is a cost minimization problem, decision a_2 would be selected which implicates the lowest cost of ₹12,500.

iii. The Savage Criterion

This criterion posits the formulation of a regret matrix. The regret matrix is determined by subtracting 5, 7, 12,and 15 from columns 1 to 4, respectively, and so the following regret matrix is obtained.

	s_1	s_2	s_3	s_4	Row Max
a_1	0	3	6	10	10
a_2	3	0	0	8	**8**
a_3	16	11	0	6	16
a_4	25	15	7	0	25

∴ Minimax

iv. The Hurwicz Criterion[19]

The following table summarizes the computation

Alternative	Row Min	Row Max	α (Row Min) + (1-α) (Row Max)
a1	5	25	25 -20α[21]
a2	7	23	23 -16α
a3	12	21	21 - 9α
a4	15	30	30 -15α

The decision maker will have to decide upon the appropriate α, and thus he can decide upon the optimum alternative.

Problem 2 E

You are required to select from the following two Projects, which are mutually exclusive: Project X:

Estimated Net Cash Flows (₹)	Probability
2,000	0.3
3,000	0.4
4,000	0.3
Project Y:	
1,000	0.2
2,000	0.2
3,000	0.2
4,000	0.2
5,000	0.2

The Expected value of both the Projects = ₹3,000

Solution:

Since, Expected Value of both the Projects are same, hence, we are required to compute Standard Deviation and Co-efficient of Variations of both the Projects:

Computation of SD of Project X

Cash Flow(X) ₹	Probability (p)	EV (Xp) ₹	X- $\bar{X}$ Variance	p (X- $\bar{X}$)^2 ₹
2,000	0.3	600	-1,000	3,00,000
3,000	0.4	1,200	0	0
4,000	0.3	1,200	+1,000	3,00,000
	EV	$\bar{X}$ = 3,000		6,00,000

SD of Project X =₹ 775 ($\sqrt{P(X-X)^2}$)

On the basis of similar calculation, the SD of project Y = ₹ 1,414. ($\sqrt{P(Y-Y)^2}$

Decision:

Project X is selected, since SD is less, having less variability.

We can also calculate Co-efficient of Variation (CV):

Project X = (SD ÷ Mean) × 100 = (₹ 775 ÷ ₹ 3,000) × 100 = 25.83 %

Project Y = ₹ 1,414 ÷ 3,000 = 47.13 %.

Decision:

Project X is selected, since its CV is less.

Problem 3

We are comparing two investment projects. Both have expected returns of 20%, but the standard deviation of Project A's returns is 15%, while the standard deviation of Project B's returns is 9%. Which one is relatively riskier?

Solution:

CV of Project A = 0.15 ÷ 0.20 = 0.75

CV of Project B = 0.09 ÷ 0.20 = 0.45

Because it has a higher Coefficient of Variation (CV), Project A is the relatively riskier project.

Problem 4

Two investments have different expected returns. Project A's expected return is 20% and the standard deviation of its returns is 15%. Project B's expected return is only 10%, while the standard deviation of its returns remains at 9%. Which project is relatively riskier?

Solution:

CV of Project A = 0.15 ÷ 0.20 = 0.75

CV of Project B = 0.09 ÷ 0.10 = 0.90

Because Project B's expected return has decreased from 20% to 10%, as compared to example 1, above Project B's coefficient of variation has increased from 0.45 to 0.90. Therefore, Project B is now the relatively riskier project.

Problem 5 E

The following information is available for a Company:

Sales Volume (units)	Probability (%)
10,000	10
12,000	15
14,000	25
16,000	30
18,000	20
Projected sales and costs are as under:	

Sales Price per unit: ₹ 6; Variable Cost per unit: ₹ 3.50; Fixed Costs: ₹ 34,000

Required:

(i) Probability that the Company will at least Break-even

(ii) Probability that the Profit will be at least ₹ 10,000.

Solution:

(i) Contribution per unit = ₹ 2.50 (₹ 6 - ₹ 3.50)

BEP (units) = Total Fixed Costs ÷ Contribution per unit = ₹ 34,000 ÷ ₹ 2.50 = 13,600 units.

The probability that at least Break-even = 0.25 + 0.30 + 0.20 = 0.75 = 75%.

(ii) The Profit will be at least ₹ 10,000:

Then, BEP (units) = ₹ 34,000 + ₹ 10,000 ÷ ₹ 2.50 = 17,600 units.

The required Probability = 20%

Problem 6 E

Several possible outcomes

A company can choose to launch a new product XYZ or not. If the product is launched, expected sales and expected unit costs might be as follows:

Units	Sales Probability	₹	Unit costs Probability
10,000	0.8	6	0.7
15,000	0.2	8	0.3

a) The decision tree could be drawn as follow:

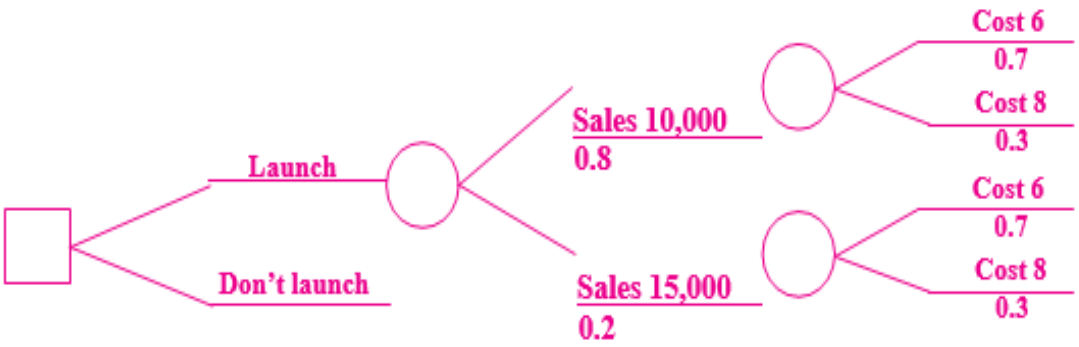

Figure 10.3 : Drawing of Decision tree

b) The layout show above will usually be easier to use than the alternative way of drawing the tree, which is as follows:

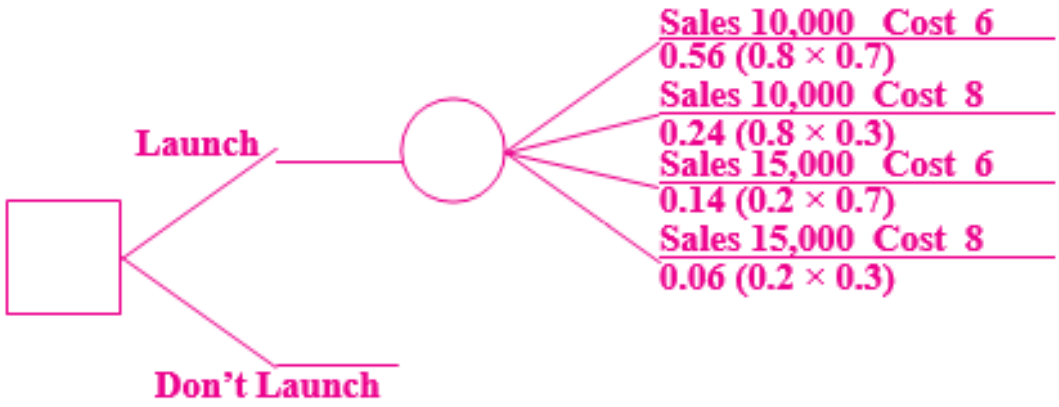

Figure 10.4 : Alternative way of drawing the Decision tree

Sometimes, a decision taken now will lead to other decisions to be taken in the future. When this situation arises,the decision tree can be drawn as a two-stage tree, as follows:

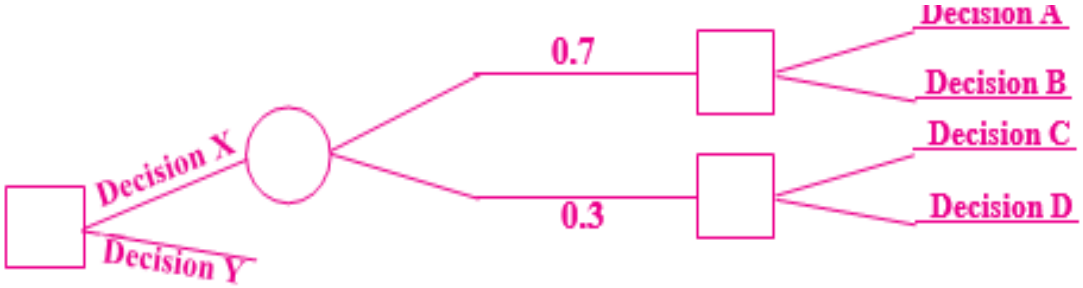

Figure 10.5 :Two-stage Decision tree

In this tree, either a choice between A and B or else a choice between C and D will be made, depending on the outcome which occurs after choosing X.

The decision tree should be in chronological order from left to right. When there are two-stage decision trees, the first decision in time should be drawn on the left.

4. DEVISIONAL PERFORMANCE MEASUREMENT

Problem 1 E

Nielsen Ltd has two divisions with the following information:

	Division A	Division B
Profit (₹)	90,000	10,000
Capital employed (₹)	3,00,000	1,00,000
ROI	30%	10%

Division A has been offered a project costing ₹1,00,000 and giving annual returns of ₹20,000. Division B has been offered a project costing ₹1,00,000 and giving annual returns of ₹12,000. The company's cost of capital is 15%. Divisional performance is judged on ROI and the ROI related bonus is sufficiently high to influence the managers' behaviour

Required:

(a) **What decisions will be made by management if they act in the best interests of their division (and in the best interests of their bonus)?**

(b) **What should the managers do if they act in the best interests of the company as a whole?**

Solution:

(a)	Division A	Division B
	(₹'000)	(₹'000)
Old ROI	90/300	10/100
	= 30%	= 10%
New ROI	(90 + 20)/ (300 + 100)	(10 + 12)/(100 + 100)
	= 27.5%	= 11%
	No	Yes

Will manager want to accept project?

The manager of Division A will not want to accept the project as it lowers her ROI from 30% to 27.5%. The manager of Division B will like the new project as it will increase their ROI from 10% to 11%.

Although the 11% is bad, it is better than before.

(b) Looking at the whole situation from the group point of view, we are in the ridiculous position that thegroup has been offered two projects, both costing ₹1,00,000. One project gives a profit of ₹20,000 and the other ₹12,000. Left to their own devices then the managers would end up accepting the project giving only ₹12,000.

This is because ROI is a defective decision-making method and does not guarantee that the correct decision will be made.

Problem 2

The following information is available of a concern. Calculate Economic Value Added (EVA). 12% Debt ₹ 2,000 crores
Equity capital ₹500 crores
Reserves and Surplus ₹7,500 crores
Risk-free rate 9%
Beta factor 1.05
Market rate of return 19%
Equity (market) risk premium 10%
Operating profit after tax ₹ 2,100 crores
Tax rate = 30%

Solution:

Capital Employed = 2000 + 500 +7500 = ₹10,000 Crores

Cost of Debt (K_d) = Interest × (1- Tax Rate) = 12% × (1- 0.3) = 8.40%

Cost of Equity (K_e) = Risk free rate + (Beta × Market Risk Premium)

= 9% +1.05(19% - 9%) =19.5%

Debt equity ratio (as given in the question) 20% & 80%

WACC= [(K_d) × Debt % + (K_e) × Equity %] = (8.40% × 20%) + (19.5% × 80%) = 17.28%

Operating Profit after tax ₹2,100 crores.

EVA = NOPAT – Cost of Capital Employed

= [(₹2,100 crores) – (17.28%) × ₹10,000 crores]

= ₹2,100 crores – ₹1,728 crores

= ₹372 crores

Problem 3 E IMP

H Ltd.'s current financial year's income statement reports its net income as ₹15,00,000. H's marginal tax rate is 40% and its interest expense for the year was ₹15,00,000. The company has ₹ 1,00,00,000 of invested capital, of which 60% is debt.

In addition, H Ltd. tries to maintain a Weighted Average Cost of Capital (WACC) of 12.6%.

(i) Compute the operating income or EBIT earned by H Ltd. in the current year.

(ii) What is H Ltd.'s Economic Value Added (EVA) for the current year?

Solution:

(i) Taxable income = Net Income ÷ (1 – Tax Rate) or, Taxable income = ₹15,00,000 ÷ (1 – 0.40) = ₹ 25,00,000 Again, taxable income = EBIT – Interest or, EBIT = Taxable Income + Interest = ₹25,00,000 + ₹ 15,00,000

= ₹40,00,000

(ii) EVA = EBIT (1 – T) – (WACC × Invested capital)

= ₹40,00,000 (1 – 0.40) – (0.126 × ₹1,00,00,000)

= ₹24,00,000 – ₹12,60,000 = ₹11,40,000.

Problem 4

The following data are given for the Delhi division for 2022:

Return on investment (ROI) 25% Sales ₹ 12,00,000

Margin 10%

Minimum required rate of return 18%

(i) Compute the division's operating assets.

(ii) Compute the division's residual income (RI).

Solution:

(i) By definition, ROI= Margin × Turnover

25% = 10% × Turnover

Therefore, the turnover must be 2.5 times.

Since, the turnover is sales/operating assets,

2.5 times = ₹ 12,00,000 ÷ Operating assets

Therefore, Operating assets = ₹ 4,80,000

(ii) RI = Operating income - Minimum required operating income

Margin = 10% = Operating income ÷ Sales = Operating income ÷ ₹ 12,00,000

Therefore, the operating income must be ₹1,20,000.

RI = ₹1,20,000 - (18% × ₹4,80,000) = ₹1,20,000 - ₹86,400 = ₹33,600

5. LEARNING CURVE

Problem 1 E

The usual learning curve model is $y = ax^b$ where, 'y' is the average time per unit for x units; 'a' is the time for first unit; x is the cumulative number of units; b is the learning coefficient and is equal to log 0.8 ÷ log 2 = – 0.322 for a learning rate of 80%. Given that a = 10 hours and learning rate 80%, you are required to calculate:

(i) The average time for 20 units.

(ii) The total time for 30 units.

(iii) The time for units 31 to 40.

Given that log 2 = 0.301, Antilog of 0.5811 = 3.812; log 3 = 0.4771, Antilog of 0.5244 = 3.345, log 4 = 0.6021, Antilog of 0.4841 = 3.049.

Solution:

(i) $y = ax^b$ or, $y = 10(20)^{-0.322}$

Taking log on both sides

$\text{Log } y = \log 10 + \log 20^{(-0.322)}$

Log y = log 10 – (0.322) log 20 = 1 – (0.322) log 20 = 1- (0.322) × log (2×10) = 1- (0.322) × (log2 + log10) = 1- (0.322) × (1.3010) = 1- 0.41892 = 0.5811

Log y = 0.5811

y = Anti log (0.5811) = 3.812 hrs (average time)

Total Time = 3.812 × 20 = 76.24 hours

(ii) Log y = log 10 + log $30^{(-0.322)}$ Log y = 1- (0.322) × (1.4771)

= 1 - (0.4756) = 0.5244

y = anti log (0.5244) = 3.345 hrs (average time)

Total time = 3.345 × 30 = 100.35 hrs

(iii) Log y = log 10 + log $40^{(-0.322)}$

= 1- (0.322) × (1.6021)

Log y = 0.4841

y = anti log (0.4841) = 3.049 hrs

Total time = 40 × 3.049 = 121.96 hrs

Time from 31 to 40 units = 121.96 – 100.35 = 21.61 hrs.

Problem 2

The learning curve as a management accounting has now become or going to become an accepted tool in industry, for its applications are almost unlimited.

When it is used correctly, it can lead to increase business and higher profits; when used without proper knowledge, t can lead to lost business and bankruptcy.

Illustrate the use of learning curves for calculating the expected average units cost of making.

(a) 4 machines

(b) 8 machines

Using the data below:

Data:

Direct Labour needed to make first machine = 1000 hrs.

Learning curve = 90%

Direct Labour cost = ₹15 per hour.

Direct materials cost = ₹ 1,50,000

Fixed cost for either size orders = ₹ 60,000.

Solution:

For Answer of the questions, (i) to (iii), please go through the relevant theory parts of this Study Material.

Statement showing computation of cost of making 4 machines & 8 machines:

No of machines	Average time Hours	Labour cost ₹	Material ₹	Fixed cost ₹	Total ₹
1	1,000	15,000	1,50,000	60,000	2,25,000

2	900	13,500	1,50,000	30,000	1,93,500
4	810	12,150	1,50,000	15,000	1,77,150
8	729	10,935	1,50,000	7,500	1,68,435

Average cost of making 4 machines = ₹ 1,77,150

Average cost of making 8 machines = ₹1,68,435

Problem 3

A firm received an order to make and supply eight units of standard product which involves intricate labour operations. The first unit was made in 10 hours. It is understood that this type of operations is subject to 80% learning rate. The workers are getting a wage rate of ₹ 12 per hour.

(i) What is the total time and labour cost required to execute the above order?

(ii) If a repeat order of 24 units is also received from the same customer, what is the labour cost necessary for the second order?

Solution:

(i) 80% Learning Curve results are given below:

Production (Units)	Cumulative Average Time (hours)	Total Time (hours)
1	10	10
2	8	16
4	6.4	25.6
8	5.12	40.96
16	4.096	65.54
32	3.2768	104.86

Labour time required for first eight units = 40.96 hours

Labour cost required for 8 units = 40.96 hours × ₹ 12/hr = ₹ 491.52

(ii) Labour time for 32 units = 104.86 hours

Labour time for first eight units = 40.96 hours

Labour time required for 2nd order for 24 units = 63.90 hours (104.86 - 40.96)

Labour cost for 24 units = 63.90 hours × ₹12/hr = ₹ 766.80

6. MARGINAL COSTING

Problem 1 E

A company is at present working at 90 per cent of its capacity and producing 13,500 units per annum. It operates a flexible budgetary control system. The following figures are obtained from its budget.

Particulars	90%	100%
Sales (₹)	15,00,000	16,00,000
Fixed expenses (₹)	3,00,500	3,00,600
Semi-fixed expenses (₹)	97,500	1,00,500

Variable expenses (₹)	**1,45,000**	**1,49,500**
Units made	**13,500**	**15,000**

Labour and material costs per unit are constant under present conditions. Profit margin is 10 per cent.

a. **You are required to determine the differential cost of producing 1,500 units by increasing capacity to 100%**

b. **What would you recommend for an export price for these 1,500 units taking into account that overseas prices are much lower than indigenous prices?**

Solution:

Computation of material and labour cost

Particulars	**₹**	**₹**
Sales at present		15,00,000
(-) Profit @ 10%		1,50,000
Total cost		13,50,000
(-) All costs other than material & labour		
Fixed expenses	3,00,500	
Semi fixed expenses	97,500	
Variable expenses	1,45,000	5,43,000
Material & Labour cost		8,07,000

a. Statement showing differential cost of 1500 units:

Particulars	**₹**
Material & Labour (₹ 8,07,600 × 1500 ÷ 13,500)	89,667
Fixed expenses (₹ 3,00,600 – ₹ 3,00,500)	100
Semi fixed expenses (₹ 1,00,500 – ₹ 97,500)	3,000
Variable expenses (₹1,49,500 – ₹ 1,45,000)	4,500
Differential cost	**97,267**

b. Differential cost per unit = ₹97,267 ÷1,500 = ₹64.84

The minimum price for these 1,500 units should not be less than ₹64.84.

Problem 2

You are given the following information for the coming year of a factory:

Particulars	**Amount**
Fixed expenses	**₹4,00,000**
Selling price per unit	**₹20**
Variable expenses per unit	**₹10**
Budgeted output	**80,000 units**

Calculate Break-even Point in Rupees and Margin of Safety in Rupees.

Solution:

For calculating Break-even Point, arranging information in the following format would be appropriate and in the format, it would be useful to show sales and variable cost per unit and fixed cost in total.(Budgeted Output – 80,000 Units)

Particulars	Per Unit (₹)	Total (₹)
Sales	20	16,00,000
Less: Variable Cost	10	8,00,000
Contribution	10	8,00,000
Less: Fixed Cost		4,00,000
Profits		4,00,000

Calculation of Break-Even Point (in ₹)

Break-Even Point (in ₹) = (Fixed Costs × Sales) ÷ Contribution
= 4,00,000 × 16,00,000 ÷ 8,00,000
= ₹8,00,000.

Calculation of Margin of Safety (in ₹)

Margin of Safety (in ₹) = Actual (or Budgeted) Sales – Break-Even Sales
= ₹16,00,000 – ₹8,00,000
= ₹8,00,000

Problem 3

From the following particulars find out break-even point:

Fixed Expenses ₹1,00,000

Selling price Per unit ₹20

Variable cost per unit ₹15

Solution:

Break-Even Point in Units = Fixed Cost ÷ Contribution per unit

Contribution per unit = Selling Price per unit - Variable Cost per unit
= ₹ 20 - ₹ 15
= ₹ 5

BEP (in units) = ₹1,00,000 ÷ ₹ 5
=20,000 units

BEP in Sales = 20,000 × ₹ 20
= ₹4,00,000

Problem 4

From the following information calculate:

(1) P/V Ratio

(2) Break-Even Point

(3) If the selling price is reduced to ₹ 80, calculate New Break-Even Point:

	₹
Total sales	**5,00,000**
Selling price per unit	**100**
Variable cost per unit	**60**
Fixed cost	**1,20,000**

Solution:

(1) P/V Ratio = Contribution ÷ Sales × 100

Contribution = Sales - Variable Cost

Total Sales = ₹ 5,00,000

Selling price per unit = ₹ 100

Sales in units = 5,000

units Contribution = ₹ 2,00,000

P/V Ratio = 40%

(2) Break-Even Point in sales = Fixed Cost ÷ P/V Ratio = ₹ 3,00,000

(3) If the Selling price is reduced to ₹ 80:

Sales =₹ 4,00,000

P/V Ratio = (80 - 60) ÷ 80 = 25%, Contribution per unit = 80 - 60 = ₹ 20

Break-Even Point (in units) = 1,20,000 ÷ 20 = 6,000 units

Break-Even Point in Sales = 1,20,000 ÷ 25% = ₹4,80,000

Problem 5

An exporter of garments is earning a profit of ₹ 1,00,000 on a sale of ₹ 12,00,000. Selling price is ₹ 40 per garment and variable cost is ₹30 per garment. The exporter incurs an additional fixed cost of ₹3,00,000 on product improvement which also enables him to economies ₹5 in per garment variable cost.

As per trade agreements, the sale of his garments is restricted to the old value of ₹ 12,00,000. What should be the selling price per garment so that the exporter earns the same profit at the same sales value?

Solution:

Units sold = Sales ÷ Selling Price per unit = ₹ 12,00,000 ÷ ₹ 40 = 30,000 units

Sales	40	12,00,000
Less: Variable cost	30	9,00,000
Contribution	10	3,00,000
Less: Profits		1,00,000
Fixed Cost		2,00,000

Hence, total fixed cost in the new case = ₹ 2,00,000 + ₹ 3,00,000 = ₹ 5,00,000
Contribution in the New Case = New Fixed Cost + Profits = 5,00,000 + 1,00,000 = ₹ 6,00,000
Since as per agreement the sale value is restricted to the old value that is ₹ 12,00,000.
Hence P/V Ratio will be:
₹ 6,00,000 ÷ ₹12,00,000 × 100 = 50%
The variable cost in the new case = ₹ 30 - ₹ 5 = ₹ 25 Variable Cost Ratio = 100 - P/V Ratio = 100 - 50 = 50%

Computation of New Selling Price:

If VC is 50, then SP = ₹ 100
If VC is 1, then SP = 100 ÷ 50
If VC is 25, then SP = 100 ÷ 50 × 25 = ₹ 50 per unit

Problem 6 E

A Company is manufacturing a product marks an average net profit of ₹ 2.50 per piece on a selling price of ₹ 14.30 by producing and selling 6,000 pieces or 60% of the capacity. His cost of sales is as under:

Particulars	₹
Direct material	**3.50**
Direct wages	**1.25**
Works overheads (50% fixed)	**6.25**
Sales overheads (25% variable)	**0.80**

During the current year, he intends to produce the same number but anticipates that fixed charges will go up by 10%, with direct labour rate and material will increase by 8% and 6% respectively but he has no option of increasing the selling price. Under this situation, he obtains an offer for further 20% of the capacity. What minimum price you will recommend for acceptance to ensure the manufacturer an overall profit of ₹ 16,730.

Solution:

Computation of profit at present after increase in cost

Particulars	₹
Selling price	14.30
Variable costs:	
Material (₹ 3.5 × 106÷100)	3.710
Labour (₹ 1.25 × 108÷100)	1.350
Works overhead	3.1250
Sales overhead	0.200
Total	8.385
Contribution per unit	5.915

Total contribution (6,000 × ₹ 5.915)		35,490
Fixed costs		
Works OH ₹3.125		
Sales OH ₹ 0.600 110/100)	3.725 (₹3.725 × 6,000 = ₹ 22,350 ×	24,585
Profit		10,905

Computation of selling price of the order	(₹)
Variable cost of order (2,000 × 8.385)	16,770
(+) required profit (16,730 – 10,905)	5,825
Sales required	22,595
Selling price of order = ₹ 22,595÷2,000 = 11.2975 (or)	11.30

Problem 7 E

A company is producing two products A and B. The particulars of the company are as follows:

Particulars	Product A (₹ per unit)	Product B (₹ per unit)
Sales	**75**	**80**
Material Cost	**15**	**20**
Labour Cost	**20**	**15**
Direct Expense	**10**	**12**
Variable overheads	**10**	**15**
Machine Hours used	**3 hours**	**2 hours**
Consumption of material	**2 kgs**	**2 kgs**

Comment on profitability of each product, if both use the same raw material, when:

(i) Total sales potential in units is key factor.

(ii) Total sales potential in values is key factor.

(iii) Raw material is in short supply.

(iv) Production Capacity (in terms of machine hr.) is the key factor.

Solution:

Particulars	Product A (₹ per unit)	Product B (₹ per unit)
Sales	75	80
Marginal Costs:		
Materials	15	20
Wages	20	15

Direct expense	10	12
Variable overheads	10	15
Total Marginal Cost	55	62
Contribution (Sales– Total marginal cost)	20	18
Contribution (per ₹ of Sales)	20/75	18/80
(Contribution/Sales)	₹ 0.267	₹ 0.225
Contribution per kg of materials	₹10	₹ 9
Contribution per hour	₹6.6	₹9

Comments:

a. When total sales potential in units is limited, product A is more profitable as its contribution per unit is more than that of product B.

b. When total sales potential in value is limiting factor, product A is more profitable as it has more contribution as per sales in rupees than that of product B.

c. Product A is more profitable than product B, when raw material is in short supply.

d. Product B is more profitable that product A, when production capacity in terms of machine hour is the key factor.

Problem 8

A Co. currently operating at 80% capacity has the following; profitability particulars:

Particulars	Amount (₹)	Amount (₹)
Sales		**12,80,000**
Costs:		
Direct Materials	**4,00,000**	
Direct labour	**1,60,000**	
Variable Overheads	**80,000**	
Fixed Overheads	**5,20,000**	**11,60,000**
Profit		**1,20,000**

An export order has been received that would utilize half the capacity of the factory. The order has either to be taken in full and executed at 10% below the normal domestic prices, or rejected totally. The alternatives available to the management are given below:

a) Reject order and Continue with the domestic sales only, as at present;

b) Accept; order, split capacity equally between overseas and domestic sales and turn away excess domestic demand;

c) Increase capacity so as to accept the export order and maintain the present domestic sales by:

(i) buying an equipment that will increase capacity by 10% and fixed cost by ₹40,000 and

(ii) Work overtime at one and a half the normal rate to meet balance of required

capacity. Prepare comparative statements of profitability and suggest the best.

Solution:

Statement showing computation of comparative profit of different alternatives:

Amount (₹)

Particulars	80% capacity	100% capacity	130% capacity
Sales	12,80,000	*8,00,000 + 7,20,000	**12,80,000 + 7,20,000
Variable cost:			
Material	4,00,000	5,00,000	6,50,000
Direct labour	1,60,000	2,00,000	2,60,000
Variable Overheads	80,000	1,00,000	1,30,000
Overtime premium			20,000
	6,40,000	8,00,000	10,60,000
Contribution	6,40,000	7,20,000	9,40,000
Fixed cost	(5,20,000)	(5,20,000)	(5,60,000)
Profit	1,20,000	2,00,000	3,80,000

From the above computations we find that the profit is more at alternative III i.e., accepting the foreign order fully & maintaining the present domestic sales.

* $\frac{12,80,000}{80\%} X \frac{1}{2} + \frac{12,80,000}{80\%} X \frac{1}{2} X 90\%$

** $12,80,000 + \frac{12,80,000}{80\%} X \frac{1}{2} X 90\%$

Problem 9

The Management Accountant of X ltd., has prepared the following estimates of working results for the year ending 31st December, 2021 for the purpose of preparing the budgets for the year ending 31st December, 2022.

Year ending 31/12/2021

Direct material	**₹/unit**	**16.00**
Direct wages	**"**	**40.00**
Variable overheads	**"**	**12.00**
Selling price	**"**	**125.00**
Fixed expenses	**₹**	**6,75,000 p.a.**
Sales	**₹**	**25,00,000 p.a.**

During the year 2022, it is expected that the material prices and variable overheads will go up by 10% and 5% respectively. As a result of re-organisation of production methods the overall direct labour efficiency will increase by 12% but the wage rate will go up by 5%. The fixed overheads are also expected to increase by ₹1,25,000. The technical director states that the same level of output as obtained in 2021

should be maintained in 2022 also and efforts should be made to maintain the same level of profit by suitably increasing the selling price. The marketing director states that the market will not absorb any increase in the selling price. On the other hand he proposes that publicity involving advertisement expenses in the proportions will increase the quantity of sales as under:

Advertisement expenses (₹)	80,000	1,94,000	3,20,000	4,60,000
Additional units of sales	2,000	4,000	6,000	8,000
Required:				

(i) Present an income statement for the year 2022.

(ii) Find the revised price and the percentage of increase in the price for 2022 if the Technical Directors' views are accepted.

(iii) Evaluate the four alternative proposals put forth by the Marketing Director, determine the best output level to be budgeted and prepare an overall income statement for 2022 at that level of output.

Solution:

I. Statement of profit at budget

Particulars	Amount (₹)
(i) Selling price	125.00
(ii) Variable cost	
a. direct material	16.00
b. direct wages	40.00
c. variable overheads	12.00
	68.00
(iii) Contribution (i-ii)	57.00
(iv) No. of units (25,00,000/125)	20,000.00
(v) Total contribution	11,40,000.00
(vi) Less: Fixed cost	6,75,000.00
(vii) Profit (v-vi)	4,65,000.00

II. Computation of selling price, if the technical director views are implemented

Variable cost	Workings	Amount (₹)
Direct material	(16 × 110%)	17.60
Direct wages	[(40 × 105%) × (100/112)]	37.50
Variable overheads	(12 × 105%)	12.60
		67.70

In order to get the same profit contribution to be recovered is as follows:

Particulars	Amount (₹)
Existing fixed overheads	6,75,000.00
Add :Expected increase	1,25,000.00

	8,00,000.00
Add : desired profit	4,65,000.00
	12,65,000.00
Therefore contribution per unit (12,65,000/20,000)	₹ 63.25
Required selling price = variable cost + contribution = 67.7+63.25	₹ 130.95
% increase in sale price = [{(130.95-125)/125}×100]	4.76%

III. Computation of additional profit at four alternatives proposed by marketing director

Additional Units	**2000**	**4000**	**6000**	**8000**
	Amount (₹)			
a. contribution per unit (125-67.7)	57.30	57.30	57.30	57.30
b. Total contribution	1,14,600.00	2,29,200.00	3,43,800.00	4,58,400.00
c. additional fixed cost	80,000.00	1,94,000.00	3,20,000.00	4,60,000.00
d. Profit/(loss)	34,600.00	35,200.00	23,800.00	(1,600.00)

Statement showing overall income for the year 2022 (₹)

a. No. of units	24,000.00
b. Contribution per unit	57.30
c. Total contribution	13,75,200.00
d. Fixed cost (8,00,000+1,94,000)	9,94,000.00
e. Profit	3,81,200.00

Problem 10

T.T.D Ltd., manufacturing a single product has normal working capacity of 8,000 units per annum. The sales manager has projected a sale of 10,000 units for the year 2021 - 22 at a price of ₹250 per unit.

The operating budget for 2021-22 as under:

Particulars	**₹ in lakhs**	**₹ in lakhs**
Sales: 8,000 units @ ₹250 each		**20.00**
Cost of production		
Raw material	**12.00**	
Direct wages	**3.00**	
Works overhead (50% Fixed)	**1.40**	
Admn. overhead (all fixed)	**0.60**	
Selling & Distribution OH (80% fixed)	**1.00**	**18.00**
Profit		**2.00**

In order to increase production to meet the sales demand, two proposals have been put forward as under:

1) Subcontracting the production of 2,000 units at ₹225 per unit.

2) Installing additional machine which will entail the following expenses:

(a) Cost of machine ₹2,00,000; Life 20 years

(b) Recruitment of 10 workers including direct workers to operate the machine at a wage rate of ₹500 each per month. Add 25% towards employee benefits. (None of the existing workers will be utilised for this purpose).

(c) Interest on capital required for the purchase of machine 15% p.a.

The following additional fixed expenses will be required in respect of both alternatives. Administration expenses - ₹10,000 per year.

Selling & Distribution expenses - ₹20,000 per year.

You are required to prepare

(1) A statement showing respective profitability of the two methods of increasing the production.

(2) Comment upon the choice of one of the two proposals.

Solution:

Statement Showing Computation of Profit at Proposed alternatives as well as present position:

	Particulars	Present Position (8000)	Sub Contract (10000)	Own Expansion (10000)
		₹ In lakhs	₹ In lakhs	₹ In lakhs
I	Sales	20	25	25
II.	Variable Cost			
	Raw Materials	12	12	15
	Direct Wages	3	3	3
	Works Overhead	0.7	0.7	0.875
	Selling & Distribution Overhead	0.2	0.2	0.25
	Sub Contract Cost		4.5	
	Add Workers			0.75
		15.9	20.4	19.875
III.	Contribution	4.1	4.6	5.125
IV.	Fixed Cost	2.1	2.4	2.8
V.	Profit	2.0	2.2	2.325

The best proposal is to produce by their own to meet the additional demand by installing a new machine because it has highest profit.

Fixed Cost includes interest & depreciation.

Problem 11 E

A company has a capacity of producing 1 lakh units of a certain product in a month. The sales department reports that the following schedule of sales prices is possible:

Volume of Production (%)	Selling Price per unit (₹)
60	0.90
70	0.80
80	0.75
90	0.67
100	0.61

The variable cost of manufacture between these levels is 15 paise per unit and fixed cost ₹ 40,000. Prepare a statement showing incremental revenue and differential cost at each stage. At which volume of production will the profit be maximum?

Solution:

Statement showing computation of differential cost, incremental revenue and determination of capacity at whichprofit is maximum:

Amount (₹)

Capacity %	Units	Sales @ 0.15	Variable Cost	Fixed Cost	Total Cost	Differential Cost	Incremental Revenue
60%	60,000	54,000	9,000	40,000	49,000	-	
70%	70,000	56,000	10,500	40,000	50,500	1,500	2,000
80%	80,000	60,000	12,000	40,000	52,000	1,500	4,000
90%	90,000	60,300	13,500	40,000	53,500	1,500	300
100%	1,00,000	61,000	15,000	40,000	55,000	1,500	70

From the above computation, it is observed that the incremental revenue is more than the differential cost up to 80% capacity; the profit is maximum at that capacity.

Problem 12 E

A plant is running at present at 50% of its capacity. The following details are available:

Particulars	Cost of production per unit (₹)
Direct materials	2
Direct Labour	1
Variable overhead	3
Fixed Overhead	2
Total Cost per unit	8
Production per month	20,000 units

Total cost of production	**₹1,60,000**
Sales Price	**₹1,40,000**
Loss	**₹20,000**

An exporter offers to buy 5,000 units per month at the rate of ₹6.50 per unit and the company hesitates to accept the offer for fear of increasing its operating losses. Advise whether the company should accept or decline this offer.

Solution:

Particulars	Existing (20,000 units)	Offer (5,000 units)	Total
	₹	₹	₹
Sales (S)	1,40,000	32,500	1,72,500
Variable Costs (V):			
Materials	40,000	10,000	50,000
Labor	20,000	5,000	25,000
Variable Overhead	60,000	15,000	75,000
Total variable cost	1,20,000	30,000	1,50,000
Contribution (S-V)	20,000	2,500	22,500
Less: Fixed Cost	40,000	---	40,000
Profit (Loss)	(-)20,000	2,500	(-)17,500

The firm must accept the offer because the amount of loss stands reduced from ₹ 20,000 to ₹17,500.

Problem 13

XYZ Co. makes a product, the Goldy, which has a variable production cost of ₹6 per unit and a sales price of ₹10 per unit. At the beginning of September 2021, there were no opening inventories and production during the month was 20,000 units. Fixed costs for the month were ₹ 45,000 (production, administration, sales and distribution). There were no variable marketing costs.

Required

Calculate the contribution and profit for September 2021, using marginal costing principles, if sales were as follows:

(a) 10,000 Goldies (b) 15,000 Goldies (c) 20,000 Goldies

Solution:

The stages in the profit calculation are as follows:

1. To identify the variable cost of sales, and then the contribution
2. To deduct fixed costs from the total contribution to derive the profit
3. To value all closing inventories at marginal production cost (₹ 6 per unit)

Amount in ₹

Particulars	10,000 Goldies	15,000 Goldies	20,000 Goldies

Sales (at ₹10)		1,00,000		1,50,000		2,00,000
Variable production cost	1,20,000		1,20,000		1,20,000	
Less: value of closing inventory (at marginal cost)	60,000		30,000			
Variable cost of sales		60,000		90,000		1,20,000
Contribution		40,000		60,000		80,000
Less: fixed costs		45,000		45,000		45,000
Profit / (loss)		(5000)		15,000		35,000
Profit (loss) per unit		(0.50)		1		1.75
Contribution per unit		4		4		4

Problem 14 E

A company is at present working at 90 per cent of its capacity and producing 13,500 units per annum. It operates a flexible budgetary control system. The following figures are obtained from its budget.

Particulars	90%	100%
Sales (₹)	**15,00,000**	**16,00,000**
Fixed expenses (₹)	**3,00,500**	**3,00,600**
Semi-fixed expenses (₹)	**97,500**	**1,00,500**
Variable expenses (₹)	**1,45,000**	**1,49,500**
Units made	**13,500**	**15,000**

Labour and material costs per unit are constant under present conditions. Profit margin is 10 per cent.

c. You are required to determine the differential cost of producing 1,500 units by increasing capacity to 100%

d. What would you recommend for an export price for these 1,500 units taking into account that overseas prices are much lower than indigenous prices?

Solution:

Computation of material and labour cost

Particulars	₹	₹
Sales at present		15,00,000
(-) Profit @ 10%		1,50,000
Total cost		13,50,000
(-) All costs other than material & labour		
Fixed expenses	3,00,500	
Semi fixed expenses	97,500	
Variable expenses	1,45,000	5,43,000

Material & Labour cost		8,07,000

c. Statement showing differential cost of 1500 units:

Particulars	₹
Material & Labour (₹ 8,07,600 × 1500 ÷ 13,500)	89,667
Fixed expenses (₹ 3,00,600 – ₹ 3,00,500)	100
Semi fixed expenses (₹ 1,00,500 – ₹ 97,500)	3,000
Variable expenses (₹1,49,500 – ₹ 1,45,000)	4,500
Differential cost	**97,267**

d. Differential cost per unit = ₹97,267 ÷1,500 = ₹64.84

The minimum price for these 1,500 units should not be less than ₹64.84.

7. ACTIVITY BASED COSTING

Problem 1 E

ABC Ltd. Is engaged in production of three types of Fruit juices:

Apple, Orange and Mixed Fruit.

The following cost data for the month of March 2020 are as under:

Particulars	Apples	Orange	Mixed fruit
Units produced and sold	10,000	15,000	20,000
Material per unit (₹)	8	6	5
Direct Labour per unit (₹)	5	4	3
No. of Purchase Orders	34	32	14
No. of Delivers	110	64	52
Shelf Stocking Hours	110	160	170

Overheads incurred by the company during the month are as under:

	₹
Ordering costs	64,000
Delivery Costs	1,58,200
Shelf stocking costs	87,560

Required:

i. **Calculated cost drivers rate.**

ii. **Calculated total cost of each product using Activity Based Costing.**

Answer:

	Apple	Orange	Mixed fruit
Material per unit	8	6	5
Direct labour per unit	5	4	3
O/H. per unit	12.6	6.816	4.0715

Product Costs P.U	25.6	16.816	12.0715

Types of cost	Amt. of Cost	Cost Driver	Cost driver cost	Cost Driver rate
Ordering cost	64000	No. of order	80	800
Delivery cost	1582000	No. of delivery	226	700
Shelf stocking	87560	Self-stocking	440	199

Types of cost	Apple	Orange	Mixed fruit
Ordering cost	(800 X 34) = 27,200	25,600	11,200
Delivery cost	(700 X 110) = 77,000	44,800	36,400
Shelf stocking	(199 X 110) = 21,890	31,840	33,830
	1,26,090	**1,02,240**	**81,430**
	÷	÷	÷
Output (units)	10,000	15,000	20,000
O/H. P.U.	12.609	6,816	4.0715
Materials	80,000	90,000	1,00,0000
Direct labour cost	50,000	60,000	60,000
Overhead cost	1,26,090	1,02,240	81,430
Total cost	**2,56,090**	**2,52,240**	**2,41,430**

Problem 2 E

PQR Ltd. Is engaged in the production of three products P, Q and R. The company calculates Activity Cost Rates on the basis of Cost Driver capacity which is provided as below:

Activity	Cost Driver	Cost Driver Capacity	Cost (₹)
Direct Labour hours	Labour hours	30,000 labour hours	300000
Production runs	No. of Productions runs	600 Production runs	180000
Quality inspections	No. of Inspection	8000 inspections	240000

The consumption of activities during the period is as under:

Activity / Products	P	Q	R
Director Labour hours	10000	8000	6000
Production runs	200	180	160
Quality inspection	3000	2500	1500

you are required to:

i. Compute the costs allocated to each product from each Activity.

ii. Calculate the cost of unused capacity for each Activity.

iii. A potential customer has approached the company for supply of 12,000 units of a new product 'S' to be delivered in lots of 1500 units per quarter. This will involve an initial design cost of ₹ 30,000 and per quarter production will involve the following:

Direct Material	₹ 18,000
Direct Labour hours	1,500 hours
No. of Production runs	15
No. of quality inspection	250

Prepare cost sheet segregating Direct and indirect costs and compute the sales value per quarter of product 'S' using ABC system considering a mark-up of 20% on costs.

Solution:

i. Statement of cost allocation to each product from each activity:

	Product			Total (₹)
	P(₹)	Q(₹)	R(₹)	
Direct labour hours (Refer to working note)	1,00,000 (10,000 hrs X ₹ 10)	80,000 (80,000 hrs X ₹ 10)	60,000 (6,000 hrs X ₹ 10)	2,40,000
Production runs (Refer to working note)	60,000 (200 runs X ₹ 300)	54,000 (180 runs X ₹ 300)	48,000 (160 runs X ₹ 300)	1,62,000
Quality Inspections (Refer to working note)	90,000 (3,000 X ₹ 30	75,000 (2,500 X ₹ 30)	45,000 (1,500 X ₹ 30)	2,10,000

❖ **Working note:**

Rate per unit of Cost Driver

Direct labour hours	(₹ 3,00,000 / 30,000 labour hours)	₹ 10 per labour hour
Production runs	(₹ 1,80,000 / 600 runs)	₹ 300 per production runs
Quality inspections	(₹ 2,40,000 / 8,000 inspections)	₹ 30 per inspection

(ii) Computation of cost of unused capacity for each activity

	₹
Direct labour hours (3,00,00 – 2,40,000) or (6,000 hours X ₹ 10)	60,000
Production runs (₹ 1,80,000 - ₹ 1,62,000) or (60 runs X ₹ 300)	18,000
Quality Inspections (₹ 2,40,000 - ₹ 2,10,000) or (1,000 inspections X ₹30)	30,000
Total cost of unused capacity	1,08,000

(iii) Cost sheet for product "S" for Quarter (1,500 units)

Direct Costs	
Direct Materials	18,000
Direct Labour (1500 hours X ₹ 10)	15,000
Initial design cost (30,000 X 1,500 / 12,000)	3,750
(A)	36,750
Indirect Costs	
Production runs (15 X ₹ 300)	4,500
Quality Inspections (250 X ₹30)	7,500
(B)	12,000
Total Cost (A + B)	48,750
(+) 20% Profit	9,750
Sales Value	
Selling Price/ unit of S	

Problem 3 E

Star limited manufacture three products using the same production methods. A conventional product costing system is being used currently. Details of the three products for a typical period are:

Product	Labour Hrs. Per unit	Machine hrs. per unit	Materials per unit	Volume (in units)
AX	1.00	2.00	35	7,500
BX	0.90	1.50	25	12,500
CX	1.50	2.50	45	25,000

Direct labour costs ₹20 per hour and production overheads are absorbed on a machine hour basis. The overhead absorption rate for the period is ₹ 30 per machine hour. Management is considering using Activity Based costing system to ascertain the cost of the products. Further analysis shows that the total production overheads can be divided as follows:

Particulars	%
Cost relating to set-ups	40
Cost relating to machinery	10
Cost relating to material handling	30

Costs relating to inspection	**20**
Total production overhead	**100**

The following activity volumes are associated with the product line for the period as a whole. Total activities for the period:

Product	No. of set-ups	No. of movements of materials	No. of inspections
AX	**350**	**200**	**200**
BX	**450**	**280**	**400**
CX	**740**	**675**	**900**
Total	**1,540**	**1,155**	**1,500**

Required:

i. **Calculated the cost per unit for each product using the conventional method.**

ii. **Calculate the cost per unit for each product using activity-based costing method.**

Solution:

i. Calculation of cost per unit for each product using the conventional method:

Particulars	AX (₹)	BX (₹)	CX (₹)
Materials cost	35	25	45
Labour cost	20	18	30
Overhead cost	60	45	75
Cost per unit	115	88	150

ii. Calculation pf the cost per unit for each product using Activity Based costing:

Total production overheads:

Product	Quantity	Cost per unit	Total overhead Cost (₹)
AX	7500	60	4,50,000
BX	12500	45	5,62,500
CX	2500	75	18,75,000
			28,87,500

Calculation of Cost Driver Rate:

Activity	Cost (₹)	Cost drivers	Cost driver rate (₹)
Cost relating to setup	₹ 28,87,500 X 40% = 11,55,000	1540 Setup	₹ 11,55,000 / 1540 = 75
Cost relating to Machinery	₹28,87,500 X 10% = ₹ 2,88,750	96250 Machine hours	₹ 2,88,750 / 96250 hours = 3
Cost relating to materials handling	₹ 28,87,500 X 30% = ₹ 8,66,250	1144 Movements	₹ 8,66,250 / 1155 = 750

Cost relating to inspection	₹ 28,87,500 X 20% = ₹ 5,77,500	1500 inspections	₹ 5,77,500 / 1500 = 385
	28,87,500		

Calculated of Overhead Cost per unit

Activity	Cos driver rate (₹)	AX (₹)	BX (₹)	CX (₹)
Setups	750	₹750 X 350 = 2,62,500	₹ 750 X 450 = 3,37,500	₹750 X 740 = 5,55,000
Machinery	3	7,500 X 2 X 3 = 45,000	12,500 X1.5 X 3 = 56,250	25,000 X 2.5 X 3 = 187500
Material Handling	750	₹ 750 X 200 = 1,50,000	₹ 750 X 280 = 2,10,000	₹750 X 675 = 5,06,250
Inspection	385	₹ 385 X 200 = 77,000	₹ 385 X 400 = 1,54,000	₹ 385 X 900 = 3,46,500
Total overhead / Quantity (Units)		5,34,500 7,500	7,57,750 12,500	15,95,250 25,000
Overhead cost per unit		71.27	60.62	63.81

Statement showing total cost per unit

Particulars	AX (₹)	BX (₹)	CX (₹)
Raw material	35	25	45
Wages	20	18	30
Overheads	71.27	60.62	63.81
Cost per unit	126.27	103.62	138.81

Problem 4 E

ABC Ltd. uses activity based costing and accumulates overhead costs in the following cost pools:

- **Human Resources**
- **Parts management**
- **Purchasing**
- **Quality Control**
- **Equipment set-up**
- **Training employees**
- **Assembly department**
- **Receiving department**

You are to find out for each cost pool whether the cost pool would be unit-level, batch-level, product-level or facility level.

Solution:

Activity Cost Pool	Level
Human Resources	Facility-level
Parts management	Product-level
Purchasing	Batch-level
Quality Control	Unit-level
Equipment set-up	Unit-level
Training employees	Facility-level
Assembly department	Unit-level
Receiving department	Batch-level