BCCA

CMA FINAL SCM & DM

MCQs BOOK v1.0

For June 24 attempt

Q – 1 to Q – 130 : PAST PAPER QUESTIONS

Q- 131 TO END : STUDY MATERIAL QUESTIONS

NOTE ; On priority basis first of all complete 1 to 130 questions , & from study mat - game theory, maxima minima, questions then if you have time solve study mat questions.

All the best

Yours

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MCQs FROM PAST PAPERS

Question:1

The following figures are extracted from the books of a company: Budgeted O/H ₹ 10,000 (Fixed ₹ 6,000, Variable ₹ 4,000)

Budgeted Hours 2000

Actual O/H ₹ 10,400 (Fixed ₹ 6,100, Variable ₹ 4,300) Actual Hours 2100

Variable O/H cost variance and Fixed O/H cost variance will be:

(a) 100 (A) and 200 (A)

(b) 100 (F) and 200 (F)

(c) 100 (A) and 200 (F)

(d) 200 (A) and 100 (F)

Solution:

(c) Variable O/H Cost variance = Recovered O/H - Actual O/H

= 4200 – 4300 = 100(A)

Fixed O/H Cost variance = 6300 - 6100 = 200 (F).

Question:2

A company produces a product which is sold at a price of ₹ 80. Its Variable cost is ₹ 32. The company's Fixed cost is ₹11,52,000 p.a. The company operates at a margin of safety of 40%. The total sales of the company is:

(a) 4,000 units

(b) 40,000 units

(c) 30,000 units

(d) 20,000 units

Solution:

(b) SP 80 – VC 32 = Contribution

48F.C. 11,52,000

B.E.P. = 11,52,000/48 – 24,000 units MOS = 40%; B.E.P. = 60%

$$\therefore Total\ sales = \frac{24{,}000 \times 100}{60} = 40{,}000\ units.$$

Question:3

The P/V ratio of a firm dealing in Electrical equipment is 50% and the margin of safety is 40%. BEP of the firm at a sales volume of ₹ 50,00,000 will be

(a) ₹ 25,00,000
(b) ₹ 35,00,000
(c) ₹ 30,00,000
(d) ₹ 36,00,000

Solution:

(c) Actual Sales - M.O.S. = BEP Sales Sales = ₹ 50,00,000
Less: Margin of safety 40% on sales = ₹ 20,00,000

Break even sales = ₹ 30,00,000

Question:4

ABC Limited has current PBIT of ₹19.20 lakhs on total assets of ₹96 lakhs. The company has decided to increase assets by ₹24 lakhs, which is expected to increase the operating profit before depreciation by ₹8.40 lakhs. There will be a netincrease in depreciation by ₹4.80 lakhs. This will result in ROI

(a) **to increase by 1%**
(b) **to decrease by 1%**
(c) **to decrease by 1-5%**
(d) **to remain the same**

Solution:

(b)

	Before installing new assets	**After installing new assets**
PBIT	₹ 19.20 lakhs	= ₹ 19.20 lakhs +(₹ 8.40 lakhs - ₹ 4.80 lakhs = ₹ 22.80 lakhs
Value of Assets	₹ 96.00 lakhs	₹ 96.00 lakhs + ₹ 24.00 lakhs = ₹ 120.00 lakhs
ROT	= 20%	= 19%

Conclusion: There will be a decrease of 1% in ROI under the proposed dispensation.

Question:5

For a Learning Curve percentage of 72%, the time to be taken to complete the 4th unit of a 12-unit job involved in the assembly line, if the initial unit requires 80 hours, will be

(a) **43.50 hrs**

(b) **41.47 hrs**

(c) **46.71 hrs**

(d) **40.95 hrs**

Solution:

(b) At 72% Learning Curve,

T-4 - Time taken by the 4th Unit = 80 (.72)(.72) = 41.47 hrs.

Note: In the arithmetic method followed above, every time the number the number of repetitions doubles, the time to perform the activity is reduced by the Learning Curve Coefficient.

Question:6

Marketing department of an organisation estimates that 40,000 of new mixers could be sold annually at a price of ₹60 each. To design, develop and produce these new mixers an investment of ₹40,00,000 would be required. The company desires a 15% return on investment (ROI). Given these data, the target cost to manufacture, sell, distribute and service one mixer will be

(a) ₹ **37.50**

(b) ₹ **40.00**

(c) ₹ **45.00**

(d) ₹ **48.60**

Solution:

(c) Projected sales (40,000 mixers X ₹60 per mixer) (A) = ₹ 24,00,000

Less desired profit (15% of ₹ 40,00,000) (B) = ₹ 6,00,000

Target Cost for 40,000 mixers (A - B) = ₹ 18,00,000

Target cost per mixer (₹ 18,00,000 / 40,000 mixer) = ₹ 45.00 per unit

Question:7

When you wait until the manufacture of a product has been completed and then record all of the related issuances of inventory from stock that were required tocreate the product, it is called

(a) **Forensic Accounting**

(b) **Back-flush Accounting**

(c) Tax Accounting

(d) Lean Accounting

Solution:

(b) Back-flush Accounting

Question:8

Match the following:

(A)	Dr. Deming believes	(1)	Common causes
(B)	Ishikawa development	(2)	To prevent defect
(C)	Type of variation is due to	(3)	Cause & effect diagram
(D)	Crosby's objective of quality	(4)	Histogram

The correct order is

(a) A-3, B-2, C-1, D-4

(b) A-2, B-3, C-4, D-1

(c) A-2, B-3, C-1, D-4

(d) A-4, B-3, C-1, D-2

Solution:

(c) A-2, B-3, C-1, D-4

Question:9

Sab Ltd. fixes the inter-divisional transfer prices for its products on the basis of cost plus a return on investment in the division. The budget for division X for 2016-17 appears as under:

	₹
Fixed Assets	5,00,000
Current Assets	3,00,000
Debtors	2,00,000
Annual Fixed cost of the Division	8,00,000

Variable cost per unit of product 10

Budgeted Volume 400000 units per year

Desired R.O.I. 28%

Transfer price for division X is

(a) ₹ 12.70

(b) ₹ 10.70

(c) ₹ 8.70

(d) ₹ 14.70

Solution:

(a) VC ₹ 10; FC per unit = ₹ 8,00,000 ÷ 4,00,000 = ₹ 2

Total Cost = 10 + 2 = ₹ 12

Required return = $\frac{10,00,000 \times 28\%}{4,00,000}$ = 0.70

$\therefore T.P. ₹ 12 + 0.70 = ₹12.70$

Question: 10

A company uses traditional standard costing system. The inspection and set-up costs are actually ₹ 1,760 against a budget of ₹ 2,000. ABC system is being implemented and accordingly the number of batches is identified as the cost driver for inspection and set up. The budgeted production is 10,000 units in batches of 1,000 units whereas actually 9,000 units were produced in 11 batches. The cost perbatch under ABC system will be

(a) ₹ 160

(b) ₹ 200

(c) ₹ 180

(d) ₹ 220

Solution:

(b) Number of batches under ABC = 9000 ÷ 1000 = 9

Std. Cost under ABC = Budg Cost / Batch × ABC number of batches

= ₹ 200 × 9 = ₹ 1800

Production	9000 Units
Number of batches	9
Cost /Batch	₹ 200

Question:11

A company has a break even point when sales are Rs. 3,20,000 and variable cost at that level of sales are Rs. 2,00,000. How much would contribution margin increase or decrease if variable expenses are dropped by Rs.30,000 ?.

(A) Increase by 27.5%

(B) Increase by 9.375%

(C) Decrease by 9.375%

(D) Increase by 37.5%

Solution:

(b) S – V = C = Rs. 3,20,000 – 2,00,000 = Rs. 1,20,000

c/s ratio = $\frac{1,20,000}{3,20,000}$ x 100 = 37.5%

New VC = Rs. 1,70,000,

C = Rs. 1,50,000

c/s ratio = $\frac{1,50,000}{3,20,000}$ x 100 = 46.875%

∴ % increase in c = 46.875 – 37.5% = 9.375%

Question:12

Twin Ltd. uses JIT and back flush accounting. It does not use a raw material stock control account. During September 2018, 10000 units were produced and sold. The standard cost per unit is Rs. 150 which includes materials of Rs. 60. During September 2018, Rs. 9,90,000 of conversion costs were incurred. The debit balance in cost of goods sold account for September 2018 was

(A) Rs.14,00,000

(B) Rs.14,80,000

(C) Rs.15,90,000

(D) Rs.16,20,000

Solution:

(ii) (c)

	Rs.
Standard cost of goods sold	15,00,000

(10,000 units @ Rs.150)	
Less : Std. material cost	6,00,000
(10,000 @ Rs. 60)	9,00,000
Standard conversion cost	
Conversion cost incurred	9,90,000
Excess charged to cost of goods	----------
sold a/c. (debit)	90,000

∴ Total debit balance of cost of goods sold Account = Rs. 15,00,000 + 90,000 = Rs. 15,90,000

Question:13

A company operates a standard absorption costing system. The budgeted fixed production overheads for the company for last year were Rs. 3,30,000 and budgeted output was 220,000 units. At the end of the company's financial year, the total of the fixed production overheads debited to the Fixed Production Overhead Control Account was Rs. 2,60,000 and the actual output achieved was 2,00,000 units. The under/over absorption of overhead was

(A) Rs. 40,000 over absorbed.

(B) Rs. 40,000 under absorbed.

(C) Rs. 50,000 over absorbed.

(D) Rs. 50,000 under absorbed.

Solution:

(a)

Overhead Absorption Rate = $\frac{Rs.3,30,000}{2,20,000\ units}$ = Rs.1.50/unit

Overhead Absorbed : 2,00,000 @ Rs. 1.50 = Rs. 3,00,000

Actual overhead	Rs. 2,60,000
Over absorbed overhead	Rs. 40,000

Question:14

A company has the capacity of producing 80000 units and presently sells 20000 units at Rs. 100 each. The demand is sensitive to selling price and it has been observed that with every reduction of Rs. 10 in selling price the demand is doubled. What should be the target cost in selling price if the demand is doubled at full capacity and profit margin on sale is taken at 25%?

(A) Rs.75

(B) Rs.90

(C) Rs.25

(D) Rs.60

Solution:

(d) as per following :

Demand	price (Rs.)
20,000	100
40,000	90
80,000	80

∴ Target cost = Rs. 80 – (25% of 80) = Rs. 60/-

Question:15

A factory can make only one of the three products X, Y or Z in a given production period. The following information are given :

Per unit Rs.	X	Y	Z
Selling Price	1500	1800	2000
Variable Cost	700	950	1000

Assume that there is no constraint on resource utilization or demand and similar resources are consumed by X,Y and Z. The opportunity cost of making one unit of Z is

(A) Rs. 850

(B) Rs. 800

(C) Rs. 1800

(D) Rs. 1500

Solution:

(a)

Opportunity cost is the cost of next best alternative foregone. Between X and Y, yhas a better contribution i.e. Rs. 850 as against X (Rs. 1500 – 700) = Rs. 800.

Question:16

AB company is a supermarket group that incurs the following costs :

(A) The bought-in price of the goods

(B) Inventory finance costs

(C) Self refilling costs

(D) Costs of repacking or 'pack out' prior to storage before sale

AB company's calculating of direct product profit (DPP) would include

(A) Costs (a) and (c) only.

(B) All of the above cost except (b)

(C) All of the above costs except (d)

(D) All of the above costs.

Solution:

(d) Because all of the costs mentioned can be identified with specific goods/productand would be deducted from the selling price to determine the direct product profit.

Question:17

S Ltd. manufactures a product whose time for the first unit is 1000 hours. It experience a learning curve of 80%, What will be the total time taken in hours for unit 5 to 8 ?

(A) 4096 hours

(B) 3200 hours

(C) 1536 hours

(D) 2000 hours

Solution:

(c) as per the following :

At 80% Learning Curve, the total time for 8 units will be 8*512 i.e. 4096 hours and for 4 units it is 4*640 i.e. 2560 hours. Hence the time taken for units 5 to 8 will be 1536(4096 – 2560)

Question:18

H Group has two divisions, Division P and Division Q. Division P manufactures an item that is transferred to Division Q. The item has no external market and 6000 units produced are transferred internally each year. The costs of each division are as follows ?

	Division P	Division Q
Variable Cost	Rs. 100 per unit	Rs. 120 per unit
Fixed cost each year	Rs. 1,20,000	Rs. 90,000

Head Office management decided that a transfer price should be set that provides a profit of Rs. 30,000 to Division P. What should be the transfer price per unit ?

(A) Rs.145

(B) Rs. 125

(C) Rs. 120

(D) Rs. 135

Solution:

(b) variable cost + (Fixed cost + Profit Desired) ÷ Volume = Rs. 100 + (1,20,000 + 30,000) ÷ 6000 = Rs. 125/-

Question:19

In the context of Critical Path Analysis, the portion of the float of an activity which cannot be consumed without affecting adversely the float of the subsequent activities is called

(A) Free float

(B) Interfering float

(C) Independent float

(D) Total float

Solution:

(b) Interfering float is that part of the total float which causes a reduction in the float of the successor activities. It is the difference between the latest finish time of theactivity in question and the earliest starting time of the following activity or zero, whichever is larger.

Question:20

In CPA (Critical Path Analysis) which of the following is not a correct step in sequence?

(A) Understanding the logic of the system under consideration

(B) Constructing the net work

(C) Providing estimates for activity duration.

(D) Implementing and controlling the net work.

Solution:

(d) Because step no. 4 i.e. (d) should be satisfying the objectives. Implementing and controlling the network would be the final step.

Question:21

The break-even point of a manufacturing company is ₹ 1,60,000. Fixed cost is ₹ 48,000. Variable cost is ₹ 12 per unit. The PV ratio will be:

(A) 20%

(B) 40%

(C) 30%

(D) 25%

Solution:

(C) **Explanation:** BEP = $\frac{FC}{P/V\ ratio} = \frac{P}{V}$ Ratio = $\frac{FC}{BEP} = \frac{RS.48,000}{1,60,000} = 30\%$

Question:22

A factory has a key resource (bottleneck) of Facility A which is available for 31,300 minutes per week. The time taken by per unit of Product X and Y in Facility A are 5 minutes and 10 minutes respectively. Last week's actual output was 4750 units of product X and 650 units of Product Y. Actual factory cost was ₹ 78,250. The throughput cost for the week would be:

(A) ₹ 75,625

(B) ₹ 76,225

(C) ₹ 77,875

(D) ₹ 79,375

Solution:

(A)

Explanation: Cost per Factory Minute = Total Factory Cost / Minutes Available = ₹ 78,250/31,300 = ₹ 2.50

Standard Minutes of throughput for the week = (4750 × 5) + (650 × 10) =30,250 minutes

Therefore, throughput Cost for the week = 30,250 × ₹ 2.50 = ₹ 75,625

Question:23

In a PERT network, the optimistic time for a particular activity is 9 weeks and the pessimistic time is 21 weeks. Which one of the following is the best estimate of the standard deviation for the activity?

(A) 12

(B) 9

(C) 6

(D) 2

Solution:

(D)

Explanation: Standard Deviation equals (pessimistic time minus optimistic Time)/6 that is 21-9/6 = 2

Question:24

The higher the actual hours worked,

(A) The lower the capacity usage ratio.

(B) The higher the capacity usage ratio.

(C) The lower the capacity utilization ratio.

(D) The higher the capacity utilization ratio.

Solution:

(D) **Explanation:** Capacity utilization ratio = $\frac{\text{Actual Hours}}{\text{Budgeted Hours}}$

So, the capacity utilization ratio would be higher.

Question:25

X is a factory making a certain product where learning curve ratio of 80% and 90% apply respectively for two equally paid workers, A and B

(A) The labour cost of manufacturing the 4^{th} product will be more for A.

(B) The labour cost of manufacturing the 4^{th} product will be more for B.

(C) The labour cost is the same for the fourth product.

(D) Nothing can be said about the specific product since learning applies ratio to the average quantity of the product.

Solution:

(B)

Explanation: The labour cost of manufacturing the 4^{th} product will be more for B since B will take more time per unit of product.

Question:26

What is the opportunity cost of making a component part in a factory given no alternative use of the capacity?

(A) The variable manufacturing cost of the component

(B) The total manufacturing cost of the component

(C) The total variable cost of the component

(D) Zero

Solution:

(D)

Explanation: Opportunity cost is not an out of pocket cost. It is the benefit given up by not selecting the next best alternative. Therefore, answers A, B and C are incorrect and D is correct.

Question:27

The product of XYZ company is sold at a fixed price of ₹ 1, 500 per unit. As per company's estimate, 500 units of the product is expected to be sold in the coming year. If the value of investments of the company is ₹ 15 lakh and it has a target ROI of 15%, the target cost would be:

(A) ₹ 930

(B) ₹ 950

(C) ₹ 1050

(D) ₹ 1130

Solution:

(C)

Explanation: ROI at 15% of total investment ₹ 15 lakhs = ₹ 15,00,000 × 0.15 = ₹ 2,25,000.

Profit per unit of future output = ₹ 2,25,000/500 = ₹ 450 per unit.

Therefore, target cost per unit = Selling Price – Profit per unit = ₹ 1,500 – ₹ 450 = ₹ 1,050 per unit.

Question:28

Max Ltd. fixes the inter divisional transfer prices for its products on the basis of cost plus a return on investment in the division. The budget for division X for 2019 – 20 appears as under –

	₹
Fixed assets	5,00,000
Current assets	3,00,000
Debtors	2,00,000
Annual fixed cost of the division	8,00,000
Variable cost per unit of the product	10
Budgeted volume	4,00,000 units per year
Desired ROI	28%

Transfer price for division X is

(A) ₹ 12.70

(B) ₹ 10.70

(C) ₹ 8.70

(D) ₹ 14.70

Solution:

(A)

Explanation:

	Per unit (₹)
VC	10
FC (₹ 8,00,000 ÷ 4,00,000)	2
Investment : (FA + CA + Debtors) = ₹ 10,00,000	
$Return = \frac{Rs.10,00,000 \times 0.28}{4,00,000}$	0.70
TP for Div. X	12.70

Question:29

Which of the following is not a correct match?

Activity	Cost Drivers
(A) Production scheduling	Number of production runs

(B) Despatching	No. of Despatch orders
(C) Goods receiving	Goods received order
(D) Inspection	Machine hours

Solution:

(D) **Explanation:** Inspection hours, and not machine hours, drive the cost of inspection.

Question:30

A manufacturing company uses two types of materials. X and Y, for manufacture of a standard product. The following information is given:

	Standard mix			Actual mix		
Materials X	120	Kg. @ ₹ 5 =	₹ 600	112	Kg. @ ₹ 5 =	₹ 560
Y	80	Kg. @ ₹ 10 =	₹ 800	88	Kg. @ ₹ 10 =	₹ 880
	200		₹ 1,400	200		₹ 1,440
30% loss	60			25% loss 50		
	140		₹ 1,400	150		₹ 1,440

Direct Materials Mix Variance is:

(A) ₹ 40 (fav.)

(B) ₹ 40 (unfav.)

(C) ₹ 80 (fav.)

(D) ₹ 80 (unfav.)

16×5=80

Solution:

(B)

Explanation: A manufacturing company uses two type of Materials, X and Y, for manufacture of a standard product:

	Standard mix			Actual mix		
Materials X	120	Kg. @ ₹ 5 =	₹ 600	112	Kg. @ ₹ 5 =	₹ 560
Y	80	Kg. @ ₹ 10 =	₹ 800	88	Kg. @ ₹ 10 =	₹ 880
	200		₹ 1,400	200		₹ 1,440
30% loss	60			25% loss 50		
	140		₹ 1,400	150		₹ 1,440

Direct Materials Mix Variance is: ₹ 40 (unfav.)

	SP (SQ – AQ)	
X	₹ 5 (120 – 112) =	₹ 40 (fav.)
Y	₹ 10 (80 – 88) =	₹ 80 (unfav.)
		₹ 40 (unfav.)

Question:31

In cost-plus pricing, the markup consists of

Solution

1. **total cost and desired ROI.**
2. **selling and administrative costs.**
3. **manufacturing costs.**
4. **desired ROI**

Question:32

A manufacturing company has the following information pertaining to a normal monthly production of 10,000 units of a product.

Standard factory overhead rates are based on a normal monthly volume of one standard direct hour per unit. Standard factory overhead rates per direct labor hour are:

Fixed	**Rs. 6.00**
Variable	**Rs. 10.00**
	Rs. 16.00
Units actually produced in current month	**9,000 units**
Actual factory overhead costs incurred	
(Includes Rs. 70,000 fixed)	**Rs. 156,000**
Actual direct labor hours	**9,000 hours**

The variable overhead spending variance is A

Solution

1. **Rs.0**
2. **Rs.10,000 (F)**
3. **Rs.4,000 (F)**
4. **Rs.86,000 (A)**

Question:33

A factory is setting up a special inspection at the supply point of raw materials at Rs. 80,000. Consequent to this, there is lesser number of returns from customers. These goods used to be sold for Rs. 1,00,000 and variable costs are Rs. 80,000. The change in quality costs are

Solution

1. Decrease by Rs. 80,000
2. Decrease by Rs. 60,000
3. Decrease by Rs. 20,000
4. ✔ No change

Question:34

Companies that would benefit from back-flush costing include companies

Solution

1. None of these.
2. whose inventories vary from period to period.
3. ✔ which have fast manufacturing lead times.
4. companies that require audit trails.

Question:35

A learning curve is a function

Solution

1. where unit costs increase as productivity increases.
2. that increases at a greater rate as workers become more familiar with their tasks.
3. that is linear.
4. ✔ that measures the decline in labor-hours per unit due to workers becoming better at a job.

Question:36

Which of the following is TRUE about the theory of constraints?

Solution

1. TOC recognizes that lower inventories means slower response to customers.
2. TOC recognizes that lowering inventory decreases carrying costs and thus decreases operating expenses and improves net income.
3. TOC recognizes that lower inventories means more defects.
4. TOC recognizes that EOQ is important.

Question:37

Activities required to design, develop, produce, market, distribute, and service a product are known as

Solution

1. target activities.
2. value-chain activities.
3. whole life activities.
4. overhead.

Question:38

Only direct materials, direct labor, and variable manufacturing overhead costs are considered product costs when using

Solution

1. absorption costing.
2. full costing.
3. variable costing.
4. product costing.

Question:39

When there is excess capacity, it makes sense to accept a one-time-only special order for less than the current selling price when

Solution

1. incremental revenues exceed incremental costs.
2. additional fixed costs need not be incurred to accommodate the order.
3. there is a positive contribution per unit of the product under normal capacity and spare capacity
4. the special order is from a normal customer.

Question:40

A company that is a price-taker would most likely use which of the following methods?

Solution

✔ 1. Target costing

2. Cost plus pricing, contribution approach

3. Cost plus pricing, absorption approach

4. Time-and-material pricing

Question:41

To complete the first setup on a new machine took an employee 200 minutes. Using an 80% incremental unit-time learning model indicates that the second setup on the new machine is expected to take

Solution

✔ 1. 120 minutes.

2. 160 minutes.

3. 60 minutes

4. 80 minutes.

Question:42

The following will be the appropriate action to finish a project early

Solution

1. Crash activities on the non critical path so that they become critical

2. Crash activities on the non critical paths so that they remain non critical

3. Crash activities on the critical path so that they become non critical

✔ 4. Crash activities on the critical paths such that the critical paths remain critical

Question:43

If the unit level of inventory increases during an accounting period, then

Solution

1. operating income will be the same under absorption costing and variable costing.

2. the exact effect on operating income cannot be determined.

✔ 3. more operating income will be reported under absorption costing than variable costing.

4. less operating income will be reported under absorption costing than variable costing.

Question:44

In a transportation matrix (where Ri are rows and Cj are columns), the second allocation under the North West Corner Rule can be

Solution

✔ 1. R1C2

2. None of these

3. R2C3

4. R1C3

Question:45

is the difference between the sales price needed to capture a predetermined market share and the desired profit per unit.

Solution

1. Gross profit

✔ 2. Target cost

3. Target price

4. None of these.

Question:46

Liability claims is an example of

Solution

1. prevention costs.

2. appraisal costs.

✔ 3. external failure costs.

4. internal failure costs.

Question:47

The is a period of time when sales increase at a decreasing rate.

Solution

✔ 1. maturity stage

2. growth stage
3. introduction stage
4. decline stage

Question:48

NM paid Rs.5,30,000 for a machine used to powder wheat. The machine can be sold forRs.1,30,000. The sale value of wheat is Rs 8,00,000 and its variable cost is Rs.4,50,000.The opportunity cost of producing wheat flour is

Solution

1. Rs. 5,30,000
2. Rs. 3,50,000
3. Rs. 8,00,000
4. ✔ Rs. 1,30,000

Question:49

Which of the following will always be a relevant cost?

Solution

1. Fixed cost
2. ✔ Opportunity cost
3. Variable cost
4. Sunk cost

Question:50

The operational activity of setting up equipment is classified as a

Solution

1. unit-level activity.
2. facility-level activity.
3. ✔ batch-level activity.
3. product-level activity.

QUESTION: 51

Choose the most appropriate answer to the following questions giving justification / reasonable workings: (One mark is for the correct choice and one mark is for the justification / workings.)

i. The Income statement of BOMA Ltd. Is summarized as below:

	(Rs in Lakhs)
Net Revenue	120
Less: Expenses (including Rs. 60 Lakh of fixed cost)	132
Net loss	12

The Manger (F&A) believers than an increase of Rs. 30 Lakh as fixed expenditure in advertising outlays will increase the sale substantially. At what sales volume will the company have break even?

a) Rs. 250 Lakh
✔ b) Rs. 225 Lakh
b) Rs. 200 Lakh
c) None of the above

Question:52

SOVI Ltd., a mobile phone manufacture, is planning to introduce a new mobile phone. The potential market over the year is 10,00,000 Units. The SOVI Ltd. Has the capacity to produce 4,00,000 units and could sell 1,00,000 units at a price of Rs. 10,00,000. Demand would double for each Rs. 1,000 fall in the selling price. The company has a 25% profit margin on sales for the similar products. What is SOVI Ltd.'s. target cost per unit to the nearest Re?

a) Rs. 8,000
b) Rs. 7,000
✔ C) Rs. 6,000
d) Rs. 4,000

Question:53

SIXT Ltd. Has developed a new product and just completed the manufacture of the first four units of the product. The first unit took 3 hours to manufacture and the first four units together took 8,3667 hours to produce. The learning curve rate is

✔ a) 83.50%

b) 75.00%
c) 60.65%
d) 58.50%

Question:54

Depreciation of product testing equipment is

a) Internal Failure Cost
✔ b) Appraisal Cost
c) Not a Quality Cost
d) Irrelevant, but Quality Cost

Question:55

AMRIT Ltd., a manufacture of doors using a Throughput costing system, is experiencing a bottleneck in its plant. Set up time at one of its work stations has been identified as the offender. The manager (Finance) has praised a plan to reduce the set up time at a cost of Rs. 5,24,000. The change will result in 500 additional doors. The selling price per door is Rs. 19,300, Direct Labor costs are Rs. 2,400 per door and the cost of direct Materials is Rs. 8,000 per door. All units produced can be sold. The change will result in an increase in the Throughput Contribution of _____.

a) Rs. 60,20,000
✔ B) Rs. 56,50,000
c) Rs.44,50,000
d) None of the above.

Question:56

RON Ltd., a manufacturing of product CEMO using a standard costing system provides the following information pertaining to the Direct Materials for the month of November, 2022:

I tonne of materials input yields standard output of (units)	1,00,000
Standard price of materials per KG (Rs)	20
The actual quality of materials used (Tones)	10
Actual price of materials per kg (Rs)	21
Actual output obtained for the month (Units)	9,00,000

Materials cost variance will be-

a) Rs. 40,000 (Adv)
b) Rs. 40,000 (Fav)
✔ C) Rs. 30,000 (Adv)
d) Rs. 25,000 (Adv)

Question:57

The constraints in a linear programming Model are –

a) Includes in the Objective function
b) Costs
✔ C) Scarce Resources
d) Dependent Variables

Question:58

A PERT network has only two activities on its critical path. The Standard Deviation of these activities are 6 and 8 respectively. What is the standard Deviation of the project completion time?

a) 7
✔ B) 10
c) 14
d) 100

Question:59

MN Ltd. Sales for the years 2018 and 2019 were Rs. 7,92,000. The cost of goods sold correspondingly were rs. 4,80,000 and Rs. 4,64,000. In the year 2019 selling price was reduced by 10% as compared to 2018, What was the decrease in gross profit caused by the change in selling price?

a) RS. 8000
b) Rs. 72,000
c) Rs. 79,200
✔ D) Rs. 88,000

Question:60

The Holiday Card Company, a producer of specialty cards, has asked you to complete several calculation based upon the following information:

Income tax rate	30%
Selling price per unit	Rs. 6.60
Variable cost per unit	Rs.5.28
Total fixed costs	Rs. 46,200

How many cards must be sold to earn an after-tax income of Rs. 18,480?

a) 60,000 units
b) 45,000 units
c) 75,000 units
✔ D) 55,000 units

Question:61

Stock Control data for Material P are:

Annual usage: 3600 units; Cost per unit: ₹100/-; Cost of placing an order: ₹40; Stockholding Cost: 20% of the overall stock volume; Lead time: One month

The EOQ based on the above data is:

(a) 210 units

(b) 175 units

(c) 90 units

(d) 120 units

Solution:

(d)

Explanation: 120 units as per the following computation:

EOQ = √2AB/C, where

A = Annual Requirement of the material = 3,600 units.

B = Buying or Ordering Cost /Order = ₹ 40.

C = Carrying or Stockholding Cost per unit per annum = ₹ 100 × 20% EOQ = √2 x 3,600 x 40/20 =120 units (d).

Question:62

Which of the following would take place if a company is able to reduce its variable cost?

Contribution Margin	Break-Even Point
(a) Increase	Increase
(b) Decrease	Decrease

(c)	Increase	Decrease
(d)	Decrease	Increase

Solution:

(c)

Explanation: Contribution margin = Sales Less Variable Cost So, reduction in variable cost will increase contribution. BEP = FC/Contribution Margin

Hence, increase in contribution will reduce BEP.

Question:63

The following details relate to Product P-1 of a manufacturing company:

Level of activity (units)	1000	2000
Cost per unit (₹):		
Direct materials	4.00	4.00
Direct labour	3.00	3.00
Production Overheads	3.50	2.50
Selling Overheads	1.00	0.50
	11.50	10.00

The total fixed cost and variable cost per unit are:

	Total Fixed Cost (₹)	Variable Cost per unit (₹)
(a)	2,000	7.00
(b)	2,000	8.50
(c)	3,000	7.00
(d)	3,000	8.50

Solution:

(d)

Explanation: Variable Cost per unit = 4.00 + 3.00 = ₹ 7.00

Total FC (included in Production Overheads and Selling Overheads) is as follows:

Units	1,000	2,000
Total OH	4.50 × 1,000 = 4,500	3.00 × 2,000 = 6,000

Difference in Overhead = ₹ 1,500

Difference in Volume = 1,000

∴ Variable per unit = ₹1.50

Add this to Variable cost per unit of ₹ 7.00.

The Total variable cost = ₹ 1.50 + ₹ 7.00 = ₹ 8.50

Fixed Cost = ₹4,500 - (1,000 × 1.50) = ₹ 4,500 - ₹ 1,500 = ₹ 3,000.

Question:64

A company makes a single product which it sells at ₹10 per unit. Fixed costs are ₹ 48,000 per month and the product has a contribution to sales ratio of 40%. In a period when actual sales were ₹1,40,000, the company's margin of safety in units was:

(a) 2000

(b) 3000

(c) 3500

(d) 4000

Solution:

(a)

Explanation: BEP = $\frac{PC}{C/S\ ratio} = \frac{48{,}000}{0.4} = ₹1{,}20{,}000\ or\ 12{,}000\ units.$

When sells are ₹ 1,40,000, the volume is ₹ 1,40,000 ÷ 10 = ₹ 14,000 units

∴ Margin of Safety is 14,000 – 12,000 = 2,000 units.

Question:65

The following tasks are associated with ABC system:

I. **Allocation of costs to products**

II. **Identification of cost pools**

III. **Identification of cost drivers**

IV. **Calculation of pool rates**

The proper order of the preceding tasks is:

(a) III, II, IV, I

(b) I, II, III, IV

(c) III, IV, II, I

(d) IV, III, II, I

Solution:

(a)

Explanation: Because cost is allocated based on the cost pool rates. So, whole process starts with identification of cost drivers followed by identification of cost pools, determination of rates and then allocation.

Question:66

A company has the capacity of production of 80000 units and presently it sells 20000 units at ₹ 100 each. The demand is sensitive to selling price and it has been observed that every reduction of ₹ 10 in selling price the demand is doubled. What should be the target cost at full capacity it profit margin on sales is taken at 25%?

(a) ₹ 58 lakhs

(b) ₹ 52 lakhs

(c) ₹ 48 lakhs

(d) ₹ 50 lakhs

Solution:

(c)

Explanation:

Maximum Capacity	80,000 Units
Present Sale	20,000 Units @ ₹ 100/-per Unit
Selling Price/Unit	Demand
100	20,000
90	40,000
80	80,000
Target Price	₹ 80
Target Cost/Unit	80 - 25% of Sales = 80 - 20 = ₹ 60/- per unit
Total Target Cost	80,000 Units × ₹60/- per unit = ₹ 48 lakhs.

Question:67

The information relating to the direct material cost of a company is as follows:

Standard price per unit	**₹ 7.20**
Actual quantity purchased in units	**1600**
Standard quantity allowed for actual production in units	**1450**
Material price variance on purchase (Favourable)	**₹ 480**

What is the actual purchase price per unit?

(a) ₹7.50

(b) ₹6.40

(c) ₹6.50

(d) ₹6.90

Solution:

(d)

Explanation:

Material Price Variance (MPV) = Standard cost of Actual Quantity - Actual Cost 480 = 7.20 × 1,600 - Actual Cost

or, Actual Cost = 11,520 - 480 = 11,040

Actual Price / Unit = 11,040 ÷ 1,600 = ₹ 6.90.

Question:68

Backflush costing is most likely to be used when:

(a) Management desires sequential tracking of costs

(b) A Just-in-Time inventory philosophy has been adopted

(c) The company carries significant amount of inventory

(d) Actual production costs are debited to work-in-progress

Solution:

(b)

Explanation: A Just-in-Time inventory philosophy has been adopted. The reason for this is that JIT assumes zero inventory for raw materials, work-in-progress and finished goods and the system of backflush accounting records the transaction only at the termination of the production and sales cycle.

Question:69

The preparation and use of standard cost, their comparison with actual costs and the measurement and analysis of variances to originating causes is defined as:

(a) Marginal Costing

(b) Standard Costing

(c) Throughput Costing

(d) Kaizen Costing

Solution:

(b)

Explanation: Because standard costing only involves the process described.

Question:70

The following are cost data for two alternative ways of processing the clerical work for legal cases brought before the district court:

	Semi-automatic	Fully automatic
Monthly fixed costs (₹):		
Occupancy	15,000	15,000
Maintenance contract	5,000	10,000
Equipment lease	25,000	1,00,000
Unit variable cost (per report) (₹)		
Supplies	80	20
Labour	60	20
Labour	60	20

The cost indifference point will be:

(a) 800 cases

(b) 850 cases

(c) 750 cases

(d) 700 cases

Solution:

(a)

Explanation: Cost Indifference Point is calculated as follows:

$$\frac{\text{Difference in monthly FC}}{Ditterence\ in\ unit\ VC}$$

$$\frac{₹\,1{,}25{,}000 - ₹45{,}000}{₹\,140 - ₹\,40} = \frac{80{,}000}{₹100} = 800\ cases.$$

Question 71 :-

A Company requires ₹ 85,00,000 in sales to meet its target net profit. Its contribution margin is 30% and the fixed costs are ₹ 15,00,000. What is the target net profit?

(a) ₹ 10,50,000

(b) ₹ 19,50,000

(c) ₹ 25,50,000

(d) ₹ 35,00,000

Solution :-

(a)

Explanation: ₹ 10,50,000

= (85,00,000 × 30%) – 15,00,000 = 10,50,000

Or

Sales × Contribution margin ratio or P.V. Ratio – Fixed Cost

Question 72 :-

In a factory where standard costing system is followed, the production department consumed 1100 kgs of a material @ ₹ 8 per kg for product X resulting in material price variance of ₹ 2200 (Fav) and material usage variance of ₹ 1000 (Adv). What is the standard material cost of actual production of product X?

(a) 11,000

(b) 20,000

(c) 14,000

(d) 10,000

Solution :-

(d)

Explanation: Actual Cost + Favourable Cost Variance = Standard Cost1

100 × 8 + 2200 – 1000 = 8800 + 1200 = 10,000

Question 73 :-

The following information relate to ABC

Activity level	60%	80%
Variable costs (₹)	12,000	16,000
Fixed costs (₹)	20,000	22,000

The differential cost for 20% capacity is

(a) ₹ 4,000

(b) ₹ 2,000

(c) ₹ 6,000

(d) ₹ 5,000

Solution :-

(c)

Explanation: Differential Costs = Differences in Fixed and Variable Cost = 4000 + 2,000 = 6,000.

Question 74 :-

By making and selling 9,000 units of a product, a company makes a profit of ₹ 10,000, whereas in the case of 7,000 units, it would lose ₹ 10,000 instead. The number of units to break-even is

(a) 7,500 units

(b) 8,000 units

(c) 7,750 units

(d) 8,200 units

Solution :-

(b)

Explanation:

Contribution for 2000 units = 20,000 (difference in profits for two outputlevels)

Hence, contribution per unit = 10.

Substituting in equation 1,00,000 = F + 10,000. Or F = 80,000.BEP = 80000 / 10 = 8000.

Question 75 :-

1200 units of microchips are required to be sold to earn a profit of ₹ 1,06,000 in a monopoly market. The fixed cost for the period is ₹ 74,000. The contribution in the monopoly market is as high as 3/4th of its variable cost. Determine the target selling price per unit.

(a) 450

(b) 325

(c) 400

(d) 350

Solution :-

(d)

Explanation: Contribution = 1,06,000 + 74,000 = 1,80,000Contribution/Unit = 180000/1200 = 150 Variable cost/unit = 150 ÷ $\frac{3}{4}$ = ₹ 200

Selling price = 350

Question 76 :-

An operation has a 90% learning curve and the first unit produced took 28 minutes. The labour cost is ₹ 20 per hour. How much should the second unit cost?

(a) ₹ 9.80

(b) ₹ 7.60

(c) ₹ 8.40

(d) ₹ 6.60

Solution :-

(b)

Explanation:

1st unit = 28 min.

Average time p.u. for 2 units = 0.9 × 28 = 25.2

Total time for 2 units = 25.2 × 2 = 50.4

Time for second unit = 50.4 – 28 = 22.4 minutes

Cost for second unit = 22.4 × 20 ₹ /hr./60 minutes = 7.47

Since, (b) is close to 7.47, b is acceptable. Otherwise, none of the given data.

Question 77 :-

If project A has a net present value (NPV) of ₹ 30,00,000 and project B has an NPV of ₹ 50,00,000, what is the opportunity cost if project B is selected?

(a) ₹ 23,00,000

(b) ₹ 30,00,000

(c) ₹ 20,00,000

(d) ₹ 50,00,000

Solution :-

(b)

Explanation:

Opportunity cost represents the next best alternative foregone.

If B is chosen, only A is being foregone and hence the NPV of 30,00,000 is the presentvalue of the opportunity lost.

Question 78 :-

A company operates an activity based costing (ABC) system to attribute its overhead costs to cost objects. In its budget for the year-ending 31st August, 2018. The company expected to place a total of 2000 purchase orders at a total cost of ₹ 1,00,000. This activity and its related costs were budgeted to occur at a constant rate throughout the budget year which is divided into 13 four week periods.

During the four week period ended 30th June 2017, a total of 200 purchase orders were placed at a cost of ₹ 9,000. The over recovery of these costs for the four week period was

(a) ₹ 2,000

(b) ₹ 3,000

(c) ₹ 1,500

(d) ₹ 1,000

Solution :-

(d)

Explanation:

For 2,000 purchase orders, cost budgeted is 1 lac. For 200, corresponding amountwould be 10,000. But actual = 9,000. Hence over recovered is 10,000 – 9000 = 1000.

Or

Cost driver rate for order = 1,00,000 / 2,000 = 50 per order.Cost recovered = 50 × 200 = 10,000.

Actual = 9,000

Over recovery = 1000

Question 79 :-

Empire Hotel has a capacity of 100 single rooms and 20 double rooms. Average occupancy is 70% for 365 days of the year. The rent for a double room is kept at 130% of a single room. The total room occupancy days in a year in terms of single room is

(a) 32193

(b) 30660

(c) 31660

(d) 30993

Solution :-

(a)

Explanation:

1 double room = 1.3 single in terms of revenue.

Capacity = 100 + 1.3 × 20 = 100 + 26 = 126 equivalent single rooms.

Total Room Occupancy p.a. = 126 × 365 × 70% = 32193 days.

Note: This can be arrived at by other ways also, taking for example 70% of only singlerooms and then double rooms, etc.

Question 80 :-

Which of the following is correct in the context of network analysis?

(a) There can be one or more activities without a predecessor in a network.

(b) Where two activities have the same start and end events, the end event of one activity is numbered differently and then connected by a dummy to the original start event.

(c) When crashing is carried out, the non-critical paths have to remain non critical.

(d) If the critical path is longer than the other paths, the project may be completed by using a path having a shorter duration.

Solution :-

(a)

Explanation:

More than 1 activity can begin at the first node, say 1 – 2, 1 – 3, 1 – 4, etc. Each ofthese will have no predecessor.

Question:- 81

XYZ Ltd. has the following alternative planned activity levels.

Level	E	F	G
Total cost	₹ 1,00,000	₹ 1,50,000	₹ 2,00,000
No. of units produced	5000	10000	15000

If fixed overhead remains constant, then fixed overhead cost per unit at Level E is

(A) ₹ 20

(B) ₹15

(C) ₹ 13-33

(D) ₹ 10

Solution

(D)

Change in Costs (B – A) ₹ 50,000

Change in Units (B – A) ₹ 5,000

VC per unit = ₹50, 000 ÷ 5,000 = ₹ 10

Total Cost at A ₹ 1,00,000

VC : 5,000 × ₹ 1050,000

Total FC ₹ 50,000 ÷ 5,000 units

= ₹ 10 per unit

Question:- 82

T Ltd. produces and sells a product. The company expects the following revenues and costs in 2018:

Revenues (400 sets sold @ ₹600 per product)	**₹ 2,40,000**
Variable costs	**₹1,60,000**
Fixed costs	**₹50,000**

What amount of sales must T Ltd. have to earn a target net income of ₹ 63,000 if they have a tax rate of 30%?

(A) ₹ 4,20,000

(B) ₹4,29,000

(C) ₹ 3,00,000

(D) ₹ 4,89,000

Solution

(A)

$$\text{Required sales} = \frac{FC + \frac{\text{Desired profit}}{1 - \text{tax rate}}}{\frac{\text{Contribution}}{\text{sales}}}$$

$$\frac{₹\,50{,}000 + 90{,}000}{1/3} = ₹\,4{,}20{,}000$$

Question:- 83

Excel Products Ltd. manufactures four products e.g. Product E, Product F, Product G and Product H using same raw materials. The input requirements for Products E, F, G and H are 1kg, 2kgs, 5kgs and 7kgs, respectively. Product-wise Selling Price and Variable Cost data are given hereunder:

Products	E	F	G	H
Selling Price (₹)	100	150	200	300
Variable Cost (₹)	50	70	100	125

Assuming raw material availability is a limiting factor, the correct ranking of the products would be:

(A) E, F, G & H

(B) E, F, H & G

(C) F, E, G & H

(D) F,E,H&G

Solution

(B)

Ranking of products would in order of contribution per limiting factor, in relative value.

	E	F	G	H
SP (₹)	100	150	200	300
VC (₹)	50	70	100	125
Contribution per unit	50	80	100	175
RM/unit (kg)	1	2	5	7

Contribution per kg of RM (₹)	50	40	20	25
Rank	1	2	4	3

∴ Correct Order of ranking : E, F, H & G

Question:- 84

S Ltd. recently sold an order of 50 units having the following costs:

	₹
Direct materials	**1,500**
Direct labour (1000 hours @ ₹ 8-50)	**8,500**
Variable overhead (1000 hours @ ₹ 4-00)[1]	**4,000**
Fixed overhead[2]	**1,400**
	15,400

[1] Allocated on the basis of direct labour-hours.

[2] Allocated at the rate of 10% of variable cost.

The company has now been requested to prepare a bid for 150 units of the same product.

If an 80% learning curve is applicable, Stone Isle's total cost on this order would be

(A) ₹ 38,500

(B) ₹ 37,950

(C) ₹ 26,400

(D) ₹ 31,790

Solution

(C)

Cumulative hours 200 × (20×0.8×0.8) = 2560

Less: 50×20 = 1000

Net hours for 150 units = 1560

Cost : Direct Materials 150×30 = 4,500

Direct Labour 1560 × 8.50=13,260

Variable Overhead 1560 × 4 = 6,240

Total Variable Cost = 24,000

Allocated Fixed OH = 10% = 2400

Estimated Cost of the Order = 26,400

Question:- 85

A company manufactures and sells packaging machines. It recently introduced activity-based costing to refine its existing system. Each packaging machine requires direct materials costs of ₹ 50,000; 50 equipment parts; 12 machine hours; 15 assembly line hours and 4 inspection hours. The details about the cost pools, allocation bases and allocation rates are given below:

Indirect cost pool	Cost allocation base	Budgeted allocation rate
Material handling	No. of component parts	₹ 8 per part
Machining	Machine hours	₹ 68 per machine hour
Assembly	Assembly line hours	₹ 75 per assembly hour
Inspection	Inspection hours	₹ 104 per inspection hour

The company has received an order for 40 can-packaging machines from a customer. Using activity-based costing, indirect costs allocated to the order of the customer would be:

(A) ₹ 1,30,850

(B) ₹ 1,25,280

(C) ₹ 1,15,050

(D) ₹1,10,280

Solution

(D)

Indirect costs per machine:	₹
Material handling	₹ 8 × 50 = 400
Machining	₹ 68 × 12 = 816
Assembly	₹ 75 × 15 = 1,125

Inspection ₹ 104 × 4 = 416

₹2,757

For the order: ₹ 2,757 × 40 = ₹ 1,10,280

Question:- 86

AB Ltd. uses standard cost system. The following information pertains to direct labour for Product X for the month of March, 2019:

Standard rate per hour	**₹ 8**
Actual rate per hour	**₹ 8.40**
Standard hours allowed for actual production	**2000 hours**
Labour Efficiency variance	**₹ 1,600**

(Adverse) What were the actual hours worked?

(A) 1,800

(B) 1,810

(C) 2,200

(D) 2,190

Solution

(C)

Labour Efficiency Variance = (ST – AT) × SR

or, (2,000 – AT) × ₹ 8 = (-) ₹ 1,600

or, AT = 7,600 ÷ 8 = 2,200 hours

Question:- 87

X Ltd. has 1000 units of an obsolete item which are carried in inventory at the original price of ₹ 50,000. If these items are reworked for ₹ 20,000, they can be sold for ₹ 36,000. Alternatively, they can be sold as a scrap for ₹ 6,000 in the market. In a decision model used to analyse the reworking proposal, the opportunity cost should be taken as

(A) ₹ 16,000

(B) ₹ 6,000

(C) ₹ 30,000

(D) ₹ 20,000

Solution

(B)

Original price is not relevant

Rework income	₹ 36,000
Less: Cost of rework	₹ 20,000
Net inflow	₹ 16,000, it is relevant

The other alternative relevant cash flow is from sale as scrap = ₹6,000

Hence the opportunity cost is ₹6.000

Question:- 88

Uniform Costing may *not* be successfully applied in the following case:

(A) In a single enterprise having a number of branches, each of which manufactures the same set of products with the same facilities.

(B) In a number of entities in the same industry bound by a trade association.

(C) In a number of units across different geographical locations manufacturing one or more of a given set of products.

(D) In different branches of the same company, each branch making a different product using a unique process.

Solution

(D)

Though the entity is the same, different products using different (unique) process cannot follow uniform costing.

Question:- 89

Which of the following is a valid constraint for a linear programming problem?

(A) $3x^2 + 4x + 1 = 0$

(B) $5xt + 2x2 \leq 10$

(C) $4xx + 3x2 > 7$

(D) (12x1 + 4x2)/3x2 ≤ 8x1

Solution

(B)

Other options do not conform to linearity or fundamental of constraints.

Question:- 90

The shadow price of skilled labour for SD Ltd. is currently ₹10 per hour. What does this mean?

(A) The cost of obtaining additional skilled labour is ₹10 per hour.

(B) There is a hidden cost of ₹10 for each hour of skilled labour actively worked.

(C) Contribution will be increased by ₹10 per hour for each extra hour of skilled labour that can be obtained.

(D) The total costs will be reduced by ₹10 for each additional hour of skilled labour that can be obtained.

Solution

(C)

A shadow price for a scarce resource is its opportunity cost. It is the amount of contribution that would be lost if one unit less of that resource were available.It is similarly the amount of additional contribution that would be earned if one unit more of that resource were available.(This is on the assumption that that the scarce resource is available at its normal variable cost).

Question:91

If the first time you perform a job takes 60 minutes, how long will the eighth job take if you are on an 80% learning curve?

a. **48 minutes**

b. **30.72 minutes**

c. **31 minutes**

d. **None of the above**

Solution:

(b)

Three doublings from 1 to 2 to 4 to 8 implies .83. Therefore, we have

60× (.8)3 = 60 ×.512 = 30.72 minutes.

Question:92

A company has 2,000 units of an obsolete item which are carried in inventory at the original purchase price of ₹30,000. If these items are reworked for ₹10,000, they can be sold for ₹18,000. Alternatively, they can be sold as scrap for ₹3,000 in the market. In a decision model used to analyze the reworking proposal, the opportunity cost should be taken as:

a. **₹8,000**
b. **₹12,000**
c. **₹3,000**
d. **₹10,000**

Solution:

(c)

Original price is not relevant

Rework income	₹18,000
Deduct cost of rework	₹10,000
Net inflow	₹8,000

It is relevant The other alternative relevant cash flow is from sale as scrap = ₹3,000. Hence, the opportunity cost is ₹3,000.

Question:93

The single price of the selling product manufactured by a company is fixed at ₹1,500 per unit. In the coming year, 500 units of the product are likely to be sold. If the total value of investments of the company is ₹15 lakhs and it has a target ROI of 15%, the target cost would be:

a. **₹9.30**
b. **₹9.50**
c. **₹1050**
d. **None of these**

Solution:

(c)

Particulars	₹

Sales Revenue = 500 × ₹ 1,500	7,50,000
Less: ROI 15% on ₹ 15 Lakhs =	2,25,000
Target Cost	5,25,000

Target Cost per unit = Target cost / 500 = 5,25,000 / 500 = ₹ 1,050.

Question:94

If the direct labour cost is reduced by 20% with every doubling of output, what will be the cost of labour for the sixteenth unit produced as an approximate percentage of the cost of the first unit produced?

a. **51.2%**

b. **40.96%**

c. **62%**

d. **None of these**

Solution:

(b)

1st	100%
2nd	80% ×100
4th	80% × 2nd
8th	80% × 4th
16th	80% × 8th = 80%×80%×80%×80% = 40.96%

Say, 41% of the time required for the first unit.

Question:95

A company determines its selling price by making up variable costs 60%. In addition, the company uses frequent selling price mark down to stimulate sales. If the mark down average 10%, what is the company's contribution margin ratio?

a. **30.6%**

b. **44%**

c. **86.4%**

d. **None of these**

Solution:

(a)

When V (Var. cost) = 100, SP = 160,

M. Cost/SP = 60/100 SP after 10% mark down of SP = 144,

Cost = 60-16=44

Contribution Margin Ratio = 44/144=0.3056=30.6%

Question:96

Back flush costing is most likely to be used when:

a. **Management desires sequential tracking of costs**

b. **A Just-in-Time inventory philosophy has been adopted**

c. **The company carries significant amount of inventory**

d. **Actual production costs are debited to work-in-progress.**

Solution:

(b)

Back flush costing is most likely to be used when Just-in-Time inventoryphilosophy has been adopted.

Question:97

A company produces two joint products, P and V. In a year, further processing costs beyond split-off point spent were ₹8,000 and ₹12,000 for 800 units of P and 400 units of V respectively. P sells at ₹25 and V sells at ₹50 per unit. A sum of ₹9,000 of joint cost were allocated to product P based on the net realization method. What were the total joint cost in the year?

a. **₹ 20,000**

b. **₹ 10,000**

c. **₹15,000**

d. **None of these**

Solution:

(c)

Products	P	V	Total
Units	800	400	
S.P. (₹)	25	50	

Sales (₹)	20,000	20,000	
Further costs (₹)	8,000	12,000	
NRV (₹)	12,000	8,000	20,000

Joint cost appropriated ₹9,000

Total Joint Cost = (9,000/12,000) x 20,000 = ₹15,000

Question:98

When allocation service department cost to production departments, the method that does not consider different cost behaviour patterns is the:

a. **Step method**
b. **Reciprocal method**
c. **Single rate-method**
d. **Dual rate-method**

Solution:

The single rate method combines fixed and variable costs without regard to cost behaviour patterns. A and B do not exactly fit in with the given question as they can be used on a single or dual rate; and Ans D allows variable costs to be allocated on different basis from fixed costs.

Question:99

The information relating to the direct material cost of a company is as under:

	₹
Standard price per unit	**3.60**
Actual quantity purchased in units	**1,600**
Standard quantity allowed for actual production in units	**1.450**
Material price variance on purchase (favourable)	**240**

What is the actual purchase price per unit?

a. **₹ 3.45**
b. **₹ 3.75**
c. **₹ 3.20**

d. **₹ 3.25**

Solution:

Actual quantity bought x standard price = 1,600 x ₹3.60 = ₹5,760Deduct favourable price variance ₹240

Actual quantity x actual price = ₹5,520 Or,1,600 x actual price = ₹ 5,520

So, Actual price ₹ 5,520/1,600 = ₹ 3.45

Question:100

A company manufactures two products using common material handling facility. The total budgeted material handling cost is ₹60,000. The other details are:

	Product X	Product Y
Number of units produced	30	30
Material moves per product line	5	15
Direct labour hour per unit	200	200

Under activity based costing system the material handling cost to be allocated to product X (per unit) would be:

a. **₹1,000**

b. **₹ 500**

c. **₹ 1,500**

d. **₹2,500**

Solution:

(b)

Total moves in material handling = 5+15=20
Percentage move for Product A = 5/20=25%

Material handling cost to be allocated to Product A = ₹60,000/25%=₹15,000
i.e., ₹ 15,000/30= ₹500 per unit.

Question:-101

120 units of semi-conductors are required to be sold to earn a profit of ₹1,00,000 in a

monopoly market. The fixed cost for the period is ₹80,000. The contribution in the monopoly market is as high as 3/4th of its variable cost. Determine the target selling price per unit.

(a) ₹4500

(b) ₹3250

(c) ₹4000

(d) ₹3500

Solution:-

(d) ₹3,500

Contribution = ₹(1,00,000 + 80,000) = ₹1,80,000

Contribution/Unit = ₹(180000 ÷ 120) = ₹1500 Variable

cost/unit = 1500 ÷ $\frac{3}{4}$ = ₹2000

Selling price = ₹1,500 + ₹2,000 = ₹3,500

Question:-102

Abhishek Ltd. operates Throughput Accounting System. The details of product A per unit are as under:

Particulars	Details
Selling Price	₹150
Material Cost	₹60
Conversion Cost	₹40
Time to Bottleneck Resources	10 minutes

The return per hour for product A is

(a) ₹540

(b) ₹300

(c) ₹240

(d) ₹180

Solution:-

(a) ₹540

(Selling Price – Material Cost) ÷ Time on bottleneck resources

= [(₹150 – ₹60) ÷ 10 minutes] × 60 = ₹540

Question:-103

Sara Ltd. is to market a new product. It can produce up to 3,00,000 units of this product. The following are the estimated cost data:

Particulars	Fixed Cost	Variable Cost
For Production up to 1,50,000 units	₹16,00,000	60%
Exceeding 1,50,000 units	₹24,00,000	50%

Sale price is expected to be ₹25 per unit.

How many units must the company sell to break even?

(a) 1,00,000 units

(b) 1,11,000 units

(c) 1,27,000 units

(d) 75,000 units

Solution:-

(b) 2,22,000 units

At a production of 1,50,000 units or less the fixed costs amount to ₹16 lakhs. Contribution is ₹10 per unit (₹25 – 60% of ₹25).

Production will however, be more than this level. Total fixed cost is then ₹24 lakhs. Contribution for first 1,50,000 units = ₹15,00,000.

Hence, to meet ₹24 lakh fixed cost, further ₹9,00,000 of contribution is required.
Contribution beyond 1,50,000 units is ₹12.5 (₹25 – 50% of ₹25).

Additional units to be sold = (₹9,00,000 ÷ ₹12.50) + 1,50,000 = (72,000 + 1,50,000) units = 2,22,000 units.

Question:-104

Sarathi Ltd. makes components and sells internally to its subsidiary and also to external market. The external market price is ₹48 per component, which gives a contribution of 40% of sales. For external sales, variable costs include ₹3 per unit for distribution costs.

This is, however not incurred in internal sales. There are no capacity constraints. To maximize company profit, the transfer price to subsidiary should be:

(a) ₹19.20

(b) ₹25.80

(c) ₹28.80

(d) None of these

Solution:-

(b) ₹25.80

= ₹48 × 60% – ₹3 = ₹25.80

Question:-105

A manufacturing company uses two types of materials- A and B, for manufacture of a standard product. The following information is given:

	Standard Mix		Actual mix		
Materials A	240 Kg	@ ₹5 = ₹1200		224 Kg	@ ₹5 = ₹1120
Materials B	160 Kg	@ ₹10 = ₹1600		176 Kg	@ ₹10 = ₹1760
	400 Kg	₹2800		400 Kg	₹2880
30% loss	120 Kg		25% loss	100 Kg	
	280 Kg	₹2800		300 Kg	₹2880

Direct Materials Mix Variance is:

(a) ₹ 80 (fav.)

(b) ₹ 80 (unfav.)

(c) ₹ 160 (fav.)

(d) ₹ 160 (unfav.)

Solution:-

(b) ₹80 (unfav.)

Revised Standard Quantity:

A	B
$\frac{240}{400} \times 400$	$\frac{160}{400} \times 400$
240 kg	160 kg

Direct Materials Mix Variance:

SP (RSQ – AQ)

A ₹5 (240 – 224) = ₹80 (fav.)

B ₹10 (160 – 176) = ₹160 (unfav.)

= ₹80 (unfav.)

Question:-106

Which of the following is/are scope of Uniform Costing:

(a) In a single enterprise having a number of branches or units, each of which may be a separate manufacturing unit

(b) In a number of concerns in the same industry bound together through a trade association or otherwise

(c) In industries which are diverse in nature

(d) Both (a) and (b)

Solution:-

(d) Both (a) and (b)

Uniform Costing methods may be advantageously applied:

(a) In a single enterprise having a number of branches or units, each of which may be a separate manufacturing unit.

(b) In a number of concerns in the same industry bound together through a trade association or otherwise, and

(c) In industries which are similar in nature such as gas and electricity, various types of transport, and cotton, jute and woolen textiles.

Question:-107

Which of the following is not a Limitation of Inter-Firm Comparison:

(a) Information about the organisation is made available freely with the fear of disclosure of confidential data to outside market or public

(b) Non-availability of a suitable base for comparison

(c) Absence of a proper system of Cost Accounting so that the costing figures supplied may not be relied upon for comparison purposes

(d) The top management may not be convinced of the utility of inter-firm comparison

Solution:-

(a) Information about the organisation is made available freely with the fear of disclosure of confidential data to outside market or public

The practical difficulties that are likely to arise in the implementation of a scheme of inter-firm comparison are:

(a) The top management may not be convinced of the utility of inter-firm comparison.

(b) Reluctance to disclose data which a concern considers to be confidential.

(c) A sense of complacence on the part of the management who may be satisfied with the present level of profits.

(d) Absence of a proper system of Cost Accounting so that the costing figures supplied may not be relied upon for comparison purposes.

(e) Non-availability of a suitable base for comparison.

Question:-108

Rudra Ltd. manufactures a product whose time for the first unit is 10000 hours. It experiences a learning curve of 80%, What will be the total time taken in hours for unit 5 to 8?

a) 40960 hours

b) 32000 hours

c) 15360 hours

d) 20000 hours

Solution:-

(c) 15360 hours

As per the data:

At 80% Learning Curve, the total time for 8 units will be $8 \times (0.8)^3 \times 10000$

40960 hours and for 4 units it is $4 \times (0.8)^2 \times 10000$ i.e. 25600 hours. Hence the time taken for units 5 to 8 will be 15360 hours i.e. (40960 – 25600).

Question:-109

Which of the following is a valid constraint for a linear programming problem?

a) $6x^2 + 8x + 2 = 0$

b) $10x1 + 4x2 \leq 20$

c) $8xx + 6x2 > 14$

d) $(24x1 + 8x2)/6x2 \leq 16x1$

Solution:-

(b) $10x1 + 4x2 \leq 20$

Other options do not conform to linearity or fundamental of constraints.

Question:-110

Which of the following is/are the method/s of solving an assignment problem:

a) **Complete Enumeration Method**

b) **Transportation Method**

c) **Both (a) and (b)**

d) **Simplified Method**

Solution:-

(c) Both (a) and (b)

There are four methods of solving an assignment problem and they are:

(1) Complete Enumeration Method

(2) Simplex Method

(3) Transportation Method and

(4) Hungarian Method

Question 111: -

Ink Ltd. makes leather purses. It has drawn up the following budget for its next financial period:

Selling price per unit ₹11.60; Variable production cost per unit ₹3.40; Sales commission 5% of selling price; Fixed production costs ₹4,30,500; Fixed selling and administration costs ₹1,98,150; Sales 90,000 units. The margin of safety represents:

(a) **5.6% of budgeted sales**

(b) **8.3% of budgeted sales**

(c) **11.6% of budgeted sales**

(d) 14.8% of budgeted sales

Solution

(b) 8.3% of budgeted sales

Unit contribution = ₹(11.60 – 3.40 – 0.58) = ₹7.62

BEP = (430500 + 198150)/7.62 = 82500

Margin of safety = (90000 – 82500)/90000 = 8.3%

Question 112: –

A company uses a predetermined overhead recovery rate based on machine hours. Budgeted factory overhead for a year amounted to ₹7,20,000, but actual factory overhead incurred was ₹7,38,000. During the year, the company absorbed ₹7,14,000 of factory overhead on 1,19,000 actual machine hours. What was the company's budgeted level of machine hours for the year?

(a) 116098
(b) 119000
(c) 120000
(d) 123000

Solution

(c) 120000

Overhead absorbed = Actual hours x Pre-determined overhead rate

Or, 714000 = 119000 x Pre-determined overhead rate

Or, Pre-determined overhead rate = 714000/119000 = ₹6

Budgeted overhead = Budgeted machine hours x budgeted overhead rate

Or, Budgeted machine hours = 720000/6 = 120000 hours

Question 113: –

A company uses standard absorption costing to value inventory. Its fixed overhead absorption rate is ₹12 per labour hour and each unit of production should take four labour hours. In a recent period when there was no opening inventory of finished goods, 20000 units were produced using 100000 labour hours. 18000 units were sold. The actual profit was ₹464000.What profit would have been earned under a standard marginal costing system?

(a) ₹368000
(b) ₹440000
(c) ₹344000
(d) ₹560000

Solution

(a) ₹368000

Standard absorption costing will include ₹96000 of the period's overhead (2000 units x 4 labour hours x ₹12 per hour) in the closing inventory valuation. Under standard marginal costing, ₹96000 would be charged against the period's profit resulting in profit being reduced by ₹96000 to ₹368000.

Question 114: -

X plc intends to use relevant costs as the basis of the selling price for a special order: the printing of a brochure which requires a particular type of paper that is not regularly used by X plc although a limited amount is in X plc's inventory which was left over from a previous job. The cost when X plc bought this paper last year was ₹15 per ream and there are 100 reams in inventory. The brochure requires 250 reams. The current market price is ₹26 per ream and resale value is ₹10 per ream.

The relevant cost of the paper to be used in printing the brochure is:

(a) ₹2500

(b) ₹4900

(c) ₹5400

(d) ₹6500

Solution

(b) ₹4900

The original purchase price is a sunk cost and therefore not a relevant cost. The relevant cost of the materials in stock is ₹1000 (100 reams @ ₹10 net realizable value). An additional 150 reams must be purchased for ₹3900 (150 x ₹26) resulting in a relevant cost of ₹4900.

Question 115: -

Alpha uses decision tree analysis to evaluate potential projects. The company has been looking at the launch of a new product which it believes has a 70% probability of success. The company is however considering undertaking an advertising campaign costing ₹50,000, which would increase the probability of success to 95%. If successful, the product would generate income of ₹200000 otherwise ₹70000 would be received. What is the maximum that the company would be prepared to pay for the advertising?

(a) ₹32500

(b) ₹29000

(c) ₹17500

(d) ₹50000

Solution

(a) ₹32500

Expected income with advertising = (200000 x 0.95) + (70000 x 0.05) = ₹193500 Expected income without advertising = (200000 x 0.7) + (70000 x 0.3) = ₹161000 The maximum amount the company should pay for advertising is the increase inexpected value of ₹32500 (193500 – 161000).

Question 116: -

A company uses standard absorption costing. The following information was recorded by the company for October:

	Budget	Actual
Output and sales (units)	8700	8200
Selling price per unit	₹26	₹31
Variable cost per unit	₹10	₹10
Total fixed overheads	₹34800	₹37000

The sales price variance for October was:

(a) ₹38500 adverse

(b) ₹38500 favourable

(c) ₹41000 adverse

(d) ₹41000 favourable

Solution

(d) ₹41000 favourable

Sales price variance =(actual margin – budgeted margin) x actual sales volume

(₹17 -₹12) x 8200 = ₹41000 favourable

Note that fixed overhead rate per unit is (₹34800/8700) = ₹4

Actual margin = 31-10-4 = ₹17

Budgeted margin = 26-10-4 = ₹12

Question 117: -

Based on the data given, what is the amount of the overhead under/over absorbed?

Budgeted overheads	**₹493200**
Budgeted machine hours	**10960**
Actual machine hours	**10493**
Actual overhead	**₹514157**

(a) ₹20957 under-absorbed

(b) ₹20957 over-absorbed

(c) ₹41972 over-absorbed

(d) ₹41972under-absorbed

Solution

(d) ₹41972 under-absorbed

Overhead absorption rate = 493200/10960 = ₹45

Overhead absorbed = 10493 x 45 = ₹472185

Overhead incurred = ₹514157

Under absorbed = ₹41972

Question 118: -

Bunny uses a JIT system and backflush accounting. It does not use a raw material stock control account. During May, 8000 units were produced and sold. The standard cost per unit is ₹100; includes materials of ₹45. During May, ₹480000 of conversion costs were incurred. The debit balance on the cost of goods sold account for May was:

(a) ₹800000

(b) ₹840000

(c) ₹880000

(d) ₹920000

Solution

(b) ₹840000

	₹
Cost of goods sold	800000

Less: Material cost	360000
Conversion cost allocated	440000
Conversion cost incurred	480000
Excess charged to Cost of goods sold A/c	40000

Total debit on Cost of goods sold A/c = ₹800000 + ₹40000 = ₹840000

Question 119: -

A company manufactures two products using common handling facility. The total budgeted material handling cost is ₹60000. The other details are:

Particulars	Product X	Product Y
Number of units produced	30	30
Material moves per product line	5	15
Direct labour hours per unit	200	200

Under ABC System, the material handling costs to be allocated to Product X (per unit) would be:

(a) ₹1000

(b) ₹500

(c) ₹1500

(d) ₹2500

Solution

(b) ₹500

Total moves in material handling = 5 + 15 = 20

Percentage move for Product A = 5/20 = 25%

Material handling cost to be allocated to Product A = 60000 x 25/100 = ₹15000

Or, = ₹15000/30 units = ₹500 p.u.

Question 120: -

The selling price of Product P is set at ₹1500 for each unit and sales for the coming year are expected to be 500 units. If the company requires a return of 15% in the coming year on

its investment of ₹1500000 in product P, the target cost for each unit for the coming year is:

(a) ₹930

(b) ₹990

(c) ₹1050

(d) ₹1110

Solution

(a) ₹1050

		₹
Sales revenue	(500 units x ₹1500)	750000
Less: Return on investment	(₹1500000 x 15/100)	225000
Total cost allowed		525000
Target cost per unit	(₹525000/500 units)	₹1050

Question 121: -

A company has over-absorbed fixed production overheads for the period by ₹6,000. The fixed production overhead absorption rate was ₹8 per unit and is based on the normal level of activity of 5,000 units. Actual production was 4,500 units. What was the actual fixed production overheads incurred for the period?

(a) ₹30,000

(b) ₹34,000

(c) ₹40,000

(d) ₹42,000

Solution

(a) ₹30,000

Absorbed overheads (4,500 units x ₹8)	= ₹36,000
Over absorbed overheads	= (₹6,000)
Actual overheads incurred	= ₹30,000

Question 122: -

Which of the following would decrease unit contribution margin the most?

(a) 15% decrease in selling price

(b) 15% increase in variable costs

(c) 15% decrease in variable costs

(d) 15% decrease in fixed costs

Solution

(a)15% decrease in selling price

Unit contribution margin (UCM) equals unit selling price minus unit variable costs. It can be decreased by either lowering the price or raising the variable costs. As long as UCM is positive, a given percentage change in selling price must have a greater effect than an equal but opposite percentage change in variable cost.

Question 123: -

A company determines its selling price by marking up variable costs 60%. In addition, the company uses frequent selling price mark downs to stimulate sales. If the mark downs average 10%, what is the company's contribution margin ratio?

(a) 27.5%

(b) 30.6%

(c) 37.5%

(d) 41.75%

Solution

(b) 30.6%

When,

Variable cost =100 (assumed at 60%)

Selling price = 100 + 60 = 160

Contribution = 160 – 100 =60

Selling price (after 10% markdown of selling price) = 160 x 90/100 = 144 Contribution

(after 10% markdown of selling price) = 60 – 16 = 44

Contribution margin ratio = $\frac{44}{144} \times 100 = 30.555\% \; or \; 30.6\%$

Question 124: -

If the capacity usage ratio of a production department is 90% and activity ratio is 99%, then the efficiency ratio of the department is _____%.

(a) 120

(b) 110

(c) 90

(d) 80

Solution

(b) 110

$$\text{Efficiency ratio} = \frac{\text{Activity ratio}}{\text{Capacity ratio}} = \frac{99\%}{90\%}$$

Question 125: -

A chemical is manufactured by combining two standard items of input A (standard price ₹60/kg) and B (₹45/kg) in the ratio of 60%:40%. 10% of input is lost during processing. If during a month 1,200kg of the chemical is produced incurring a total cost of ₹69,600, the total material cost variance will be _____.

(a) ₹2,400 (A)

(b) ₹2,400 (F)

(c) ₹3,000 (A)

(d) ₹2,000 (F)

Solution

(b) ₹2,400 (F)

Material	Quantity	Rate	Amount
	Kgs.	(₹)	(₹)
A	60	60	3,600
B	40	45	1,800
	100		5,400
Less:	10		
	90		

Standard cost of output = ₹5,400/90 kgs = ₹60/kg

Material cost variance = (1,200 kg x ₹60) -₹69,600 = ₹2,400(F)

Question 126: -

A company has 2,000 units of an obsolete item which are carried in inventory at the original purchase price of ₹30,000. If these items are reworked for ₹10,000, they can be

sold for ₹18,000. Alternatively, they can be sold as scrap for ₹3,000 in the market. In a decision model used to analyze the reworking proposal, the opportunity cost should be taken as:

(a) ₹8,000
(b) ₹3,000
(c) ₹10,000
(d) ₹30,000

Solution

(b)₹3,000

Net inflow = Rework income – Cost of rework

= ₹18,000 -₹10,000 = ₹8,000

The original price of ₹30,000 is not relevant and only ₹8,000 is relevant for decision making. The other alternative relevant cash flow is from sale of scrap i.e., ₹3,000. Hence, the opportunity cost is ₹3,000.

Question 127: -

A company absorbs overheads on machine hours. In a period, actual machine hours were 17,285, actual overheads were ₹4,96,500 and there was under- absorption of ₹12,520. What was the budgeted overhead absorption rate per machine hour (to the nearest ₹)?

(a) 29
(b) 28
(c) 27
(d) 26

Solution

(b) 28

Actual overheads incurred ₹4,96,500

Under-absorbed overhead ₹12,520

Actual overheads absorbed ₹4,83,980

$\frac{Actual\ overheards\ absorbed}{Actual\ machine\ hours}$ Amount absorbedper machine hour

$\frac{4,83,980}{17,285} = 28$ per machinehour

Question 128: -

Z plc provides a single service to its customers. An analysis of its budget for the year ending 31st Dec shows that in period 4, when the budgeted activity was 5,220 service units

with a sales value of ₹42 each, the margin of safety was 19.575%. The budgeted contribution to sales ratio of the service is 40%. Budgeted fixed costs in period 4 were nearest to:

(a) ₹1,700
(b) ₹71,000
(c) ₹88,000
(d) ₹1,76,000

Solution

(b) ₹71000

Break-even point (units) = 5,220 – (19.575% x 5,220)
= 4,198 units

Fixed costs = Contribution at the break-even point
= 4,198 x ₹42 x 40%
= ₹70,526

Question 129: -

ABC is defined as cost attribution to _____ on the basis of benefit received from indirect activities.

(a) Cost units
(b) Cost objects
(c) Cost centres
(d) Production units

Solution

(a) Cost units

ABC is defined as cost attribution to cost units on the basis of benefit received from indirect activities. It required to trace the significant activities in the organization and attempts to absorb the costs of such activities into product cost on the basis of benefit received by such unit.

Question 130: -

A company operates through accounting system. The details of product X per unit are as under: selling price ₹50; Material cost ₹20; Conversion cost ₹15.

Time on bottleneck resources 10 minutes.

The return per hour for product X is:

(a) ₹210
(b) ₹180

(c) ₹300

(d) ₹90

Solution

(b) ₹180

Return per hour for product X = $\frac{\text{SellingPrice} - \text{Material Cost}}{Time\ on\ bottleneck\ resource}$

$= \frac{₹\,50 - ₹\,20}{10\ minutes} X60 = ₹180\ per\ hour$

STUDY MAT MCQS

Question 131 : -

Which of the following is not a primary activity of Value Chain?

A. Inbound Logistics
B. Operations
C. Service
D. Infrastructure

Question 132 : -

Which of the following is not a secondary activity of Value Chain?

A. Procurement
B. Human Resource Development
C. Service
D. Technology Development

Question 133 : -

Which of the following is not a term normally used in value analysis?

A. Resale value
B. Use value
C. Esteem value

D. Cost value

Reason: The resale value is normally referred to as the 'exchange value.

Question 134 : -

A company has forecast sales and cost of goods sold $\left(\therefore \text{ Inventory Turnover} = \frac{CoGS}{\text{Average Inventory}}\right) for$ the coming year as ` 25 lakhs and ` 18 lakhs respectively. The inventory turnover has been taken as 9 times per year. In case the inventory turnover increases to 12 times and the short-term interest rate on working capital is taken as 10%, what will be the saving in cost?

A. ` 10,000
B. ` 20,000
C. ` 15,000
D. ` 5,000

Answer:

1	D	2	C	3	A	4	D

Question 135 : -

TQM stands for

A. Technical Quantitative Management
B. Total Quality Management
C. Theory of Queuing Management
D. None of the Above

Question 136 : -

Four Ps of Total Quality Management

A. Principles, Project, Problem, & Process
B. People, Process, Problem & Preparation
C. Product identification, Product quality, Product utility & Product expectation
D. None of the above

Question 137 : -

PRAISE stands for

A. Appreciating someone
B. Product, Recognition, Adoption, Invention, Solution & Evaporation
C. Problem Identification, Ranking, Analysis, Innovation, Solution & Evaluation
D. None of the above

Question 138 : -

Six Sigma is about

A. Quality systems

B. Quality control process

C. Statistical technique

D. None of the above

Question 139 : -

DMIADV is a methodology associated with

A. Pareto Analysis

B. PRAISE

C. Six Sigma

D. None of the above

Question 140 : -

Pareto analysis recognizes

A. 80:20 Rule

B. 50:50 Rule

C. 20:80 Rule

D. None of the above

Question 141 : -

Cost of Rework is a cost related to

A. Internal failure

B. Appraisal

C. Prevention

D. None of the above

Question 142 : -

The cost incurred to ensure that failures do not happen

A. External failure cost

B. Internal failure cost

C. Prevention cost

D. None of the above

Question 143 : -

Which of the following is not the quality parameter for service organizations?

E. Consistency

F. Friendliness

G. Durability

H. Promptness

Answer

1	2	3	4	5	6	7	8	9
B	B	C	A	C	A	A	C	C

Question 144 : -

The break-even point of a manufacturing company is ` 1,60,000. Fixed cost is ` 48,000. Variable cost is ` 12 per unit. The PV ratio will be:

A. 20%
B. 40%
C. 30%
D. 25%

Workings

PV Ratio = FC ÷ BEP = 48000 ÷ 160000 = 30%

Explanatory Comment

Please remember that PV Ratio can be worked by dividing the contribution with sales or by dividing the fixed cost with BEP sales.

Question 145 : -

The higher the actual hours worked,

A. The lower the capacity usage ratio.
B. The higher the capacity usage ratio.
C. The lower the capacity utilization ratio.
D. The higher the capacity utilization ratio.

Explanatory Comment

Capacity utilization ratio is worked out by dividing the actual hours with the budgeted hours. Therefore, higher the actual hours, higher would be the utilisation ratio.

Question 146 : -

XYZ Ltd. has the following alternative planned activity levels.

Level	E	F	G
Total cost (`)	1,00,000	1,50,000	2,00,000
No. of units produced	5000	10000	15000

If fixed overhead remains constant, then fixed overhead cost per unit at Level E is:

A. ` 20
B. ` 15
C. `13.33
D. ` 10

Workings

Level	E	F	G
Total cost (`)	1,00,000	1,50,000	2,00,000
No. of units produced	5000	10000	15000
Change in Total Cost		(1,50,000 – 1,00,000) = 50,000	(2,00,000 – 1,50,000) = 50,000
Change in units		(10000-5000) = 5000	(15000-10000) = 5000
Variable Cost per Unit (Change in TC ÷ Change in Units)		(50,000 ÷ 5000) = 10	(50,000 ÷ 5000) = 10
Total Variable Cost		10,000 × 10 = 1,00,000	15,000 × 10 = 1,50,000
Total Fixed Cost		(TC – VC) = (1,50,000 – 1,00,000) = 50,000	(TC – VC) = (2,00,000 – 1,50,000) = 50,000

Therefore, Fixed Cost at Level E also would be `50,000

Accordingly, Fixed Cost per unit at Level E = (FC ÷ No. of units) = (50,000 ÷ 5,000) = `10

Explanatory Comment

The problem is based on the fundamental principle that variable costs tend to vary in direct proportion
to the level of activity whereas fixed costs tend to remain constant.

Question 147 : -

T Ltd. produces and sells a product. The company expects the following revenues and costs in 2018:
Revenues (400 sets sold @ `600 per product) = ` 2,40,000
Variable costs = ` 1,60,000
Fixed costs = ` 50,000
What amount of sales must T Ltd. have to earn a target net income of `63,000 if they have a tax rate of 30%?

A. ` 4,20,000
B. `4,29,000
C. `3,00,000
D. `4,89,000

Workings

Sales = `2,40,000

Variable Cost = `1,60,000

Contribution = (2,40,000 – 1,60,000) = `80,000

Contribution of Sales Ratio P.V. Ratio = (80000 ÷ 240000) = 33.33%

Fixed Costs = `50,000

Profit Before Tax = (80,000 – 50,000) = `30,000

Target Net Income (TNI) = ` 63,000

Tax Rate (t) = 30%

Therefore, Target Profit Before Tax (TPBT) = {TNI ÷ (1-t)} = {63,000 ÷ (1-0.30)} = (63,000 ÷ 0.70) = `90,000

Target Contribution = (TPBT + FC) = (90,000 + 50,000) = `1,40,000

Target sales = $\frac{Target\ Contrribution}{\text{Contribution of Sales Ratio}} = (1{,}40{,}000 \div 33.33\%) = ₹4{,}20{,}000$

Question 148 : -

Excel Products Ltd. manufactures four products e.g. Product E, Product F, Product G and Product H using same raw materials. The input requirements for Products E, F, G and H are 1kg, 2kgs, 5kgs and 7kgs, respectively. Product-wise Selling Price and Variable Cost data are given hereunder:

Products	E	F	G	H
Selling Price (`)	100	150	200	300
Variable Cost (`)	50	70	100	125

Assuming raw material availability is a limiting factor, the correct ranking of the products would be:

A. E, F, G & H
B. E, F, H & G
C. F, E, G & H
D. F, E, H & G

Workings

Products	E	F	G	H
1. Selling Price (`)	100	150	200	300
2. Variable Cost (`)	50	70	100	125
3. Contribution (1 – 2)	50	80	100	175
4. Raw Material (Kg)	1	2	5	7
5. Contribution per Kg of Raw Material (3 ÷ 4)	50	40	20	25

6. Ranking (on the Basis of 5)	1	2	4	3

Therefore, correct order of ranking = E, F, H & G

Question 149 : -

A company has a breakeven point when sales are ` 3,20,000 and variable cost at that level of sales are ` 2,00,000. How much would contribution margin increase or decrease if variable expenses are dropped by `30,000?

A. Increase by 27.5%
B. Increase by 9.375%
C. Decrease by 9.375%
D. Increase by 37.5%

Workings

Contribution = (Sales – Variable Costs) = (3,20,000 – 2,00,000) = `1,20,000

P.V. Ratio / C/S Ratio = {(Contribution ÷ Sales) × 100} = {(1,20,000 ÷ 3,20,000) × 100} = 37.5%

Decrease in Variable Cost = `30,000

Revised Variable Cost = (2,00,000 – 30,000) = `1,70,000

Revised Contribution = (3,20,000 – 1,70,000) = `1,50,000

Revised C/S or P.V. Ratio = {(1,50,000 ÷ 3,20,000) × 100} = 46.875%

Increase in Contribution Margin = (46.875% - 37.5%) = 9.375%

Question 150 : -

The Tech Company has fixed costs of `400,000 and variable costs are 75% of the selling price. To realize profits of `100,000 from sales of 5,00,000 units, the selling price per unit

A. must be `1.00
B. must be `4.80
C. must be `4.00
D. cannot be determined

Workings

Desired Profit = 1,00,000

Fixed Costs = 4,00,000

Desired Contribution = (1,00,000 + 4,00,000) = 5,00,000

PV Ratio = 25%

Desired Sales = (Contribution ÷ PV Ratio)

= (5,00,000 ÷ 25%) = 20,00,000

Number of Units = 5,00,000

Selling Price per Unit = (20,00,000 ÷ 5,00,000) = `4/-

Question 151 : -

A company makes components and sells internally to its subsidiary and also to external market. The external market price is `24 per component, which gives a contribution of 40% of sales. For external sales, variable costs include `1.50 per unit for distribution costs. This is, however not incurred in internal sales. There are no capacity constraints. To maximize company profit, the transfer price to subsidiary should be:

A. `9.60

B. `12.90

C. `14.40

D. None of these

Workings

Transfer Price = Marginal Cost – Opportunity Gain

= `24 × 60% – `1.50

= 14.40 – 1.50 = `12.90.

Question 152 : -

H Group has two divisions, Division P and Division Q. Division P manufactures an item that is transferred to Division Q. The item has no external market and 6000 units produced are transferred internally each year. The costs of each division are as follows:

	Division P	Division Q
Variable Cost (`)	100 per unit	120 per unit
Fixed cost each year (`)	1,20,000	90,000

Head Office management decided that a transfer price should be set that provides a profit of ` 30,000 to Division P. What should be the transfer price per unit?

A. `145

B. `125

C. `120

D. `135

Workings

For Division P

Target Profit = `30,000

Fixed Cost = `1,20,000

Target Contribution = (30,000 + 1,20,000) = 1,50,000

Target Contribution per unit = 1,50,000 ÷ 6000 = 25

Target Sale Price per unit = (Target Contribution + Variable Cost)

= (25 + 100) = `125

Question 153 : -

A particular job required 800 kgs of material – P. 500 kgs. of the particular material is currently in stock. The original price of the material – P was `300 but current resale value of the same has been determined as `200. If the current replacement price of the material – P is `0.80 per kg., the relevant cost of the material – P required for the job would be:

A. `640

B. `440

C. `300

D. None of these

Workings:

Particulars	`
500 kgs of material in stock at resale value	200
Balance 300 kgs of material at current price of ` 0.80	240
Relevant Cost of the Material	440

Question 154 : -

What is the opportunity cost of making a component part in a factory given no alternative use of the capacity?

A. The variable manufacturing cost of the component

B. The total manufacturing cost of the component

C. The total variable cost of the component

D. Zero

Explanatory Comment:

Opportunity Cost is the "cost" incurred by not enjoying the benefit associated with the best alternative choice. In the instant case there is no (zero) alternative use for the capacity. Hence, answer (D) is correct.

Question 155 : -

If project A has a net present value (NPV) of ` 30,00,000 and project B has an NPV of ` 50,00,000, what is the opportunity cost if project B is selected?

A. ` 23,00,000
B. ` 30,00,000
C. ` 20,00,000
D. ` 50,00,000

Explanatory Comment:

Opportunity cost represents the next best alternative foregone. If B is chosen, only A is being foregone and hence the NPV of `30,00,000 is the Net present value of the opportunity lost.

Question 156 : -

X Ltd. has 1000 units of an obsolete item which are carried in inventory at the original price of `50,000. If these items are reworked for ` 20,000, they can be sold for ` 36,000. Alternatively, they can be sold as a scrap for ` 6,000 in the market. In a decision model used to analyse the reworking proposal, the opportunity cost should be taken as:

A. ` 16,000
B. ` 6,000
C. ` 30,000
D. ` 20,000

Workings

Original price of ` 50,000 is not relevant.

Rework income = ` 36,000

Less: Cost of rework = ` 20,000

Net Inflow = ` 16,000 which is relevant.

The other alternative, relevant for cash flow, is from sale as scrap, i.e.. ` 6,000
Hence the opportunity cost is ` 6,000

Question 157 : -

The shadow price of skilled labour for SD Ltd. is currently ` 10 per hour. What does this mean?

A. The cost of obtaining additional skilled labour is ` 10 per hour.

B. There is a hidden cost of ` 10 for each hour of skilled labour actively worked.

C. Contribution will be increased by ` 10 per hour for each extra hour of skilled labour that can be obtained.

D. The total costs will be reduced by ` 10 for each additional hour of skilled labour that can be obtained.

Explanatory Comment:

A shadow price for a scarce resource is its opportunity cost. It is the amount of contribution that would be lost if one unit less of that resource were available. It is similarly the amount of additional contribution that would be earned if one unit more of that resource were available. (This is on the assumption that that the scarce resource is available at its normal variable cost).

Question 158 : -

A factory can make only one of the three products X, Y or Z in a given production period. The following information is given:

Per unit `	X	Y	Z
Selling Price	1500	1800	2000
Variable Cost	700	950	1000

Assume that there is no constraint on resource utilization or demand and similar resources are consumed by X,Y and Z. The opportunity cost of making one unit of Z is:

A. ` 850

B. ` 800

C. ` 1,800

D. ` 1,500

Workings: **(Amount in `)**

Serial	Particulars	X	Y	Z
1	Selling Price	1500	1800	2000
2	Variable Cost	700	950	1000
3	Contribution	800	850	1000
4	(1-2) Ranking	3	2	1

Explanatory Comment:

Next best alternative for Z is Y which gives a contribution of ` 850 (Higher amoung X and Y). Therefore, Opportunity cost of Z = ` 850.

Question 159 : -

A company has 2000 units of an obsolete item which are carried in inventory at the original purchase price of ` 30,000. If these items are reworked for ` 10,000, they can be sold for ` 18,000. Alternatively, they can be sold as scrap for ` 3,000 in the market. In a decision model used to analyse the reworking proposal, the opportunity cost should be taken as:

E. ` 8,000

F. ` 12,000

G. ` 3,000

H. ` 10,000

Workings

(i) Original price is not relevant

(ii) Net Inflow from Rework (`)

A. Rework Income	18,000
B. Deduct cost of rework	10,000
Net Inflow (A – B)	8,000 It is relevant

The other alternative relevant for cash flow is from sale as scrap = ` 3,000 Hence, the opportunity cost is ` 3,000 for the Reworking Proposal.

Question 160 : -

TM Company can make 100 units of a necessary component part with the following costs (`)

Direct Materials 60,000

Direct Labour 10,000

Variable Overhead 30,000

Fixed Overhead 20,000

TM Company can purchase the component externally for `1,10,000 and only `5,000 of the fixed costs can be avoided, what is the correct make-or-buy decision?

A. Make and Save `5000

B. Buy and save `5,000

C. Make and Save `1,5000

D. Buy and save `15,000

Workings

Variable Costs of Making = (Direct Materials + Direct Labour + Variable Overhead)

= (60,000 + 10,000 + 30,000)

= ` 1,00,000

Hence, cost of making = ` 1,00,000

Cost of Buying = (Buying Costs – Avoidable Fixed Costs)

= (1,10,000 – 5,000)

= ` 1,05,000

Make and Save = (1,05,000 – 1,00,000)

= `5,000

Question 161 : -

AP Products sells product A at a selling price of ` 40 per unit. Ap's cost per unit based on the full capacity of 5,00,000 units is as follows:

Direct Materials	**6**
Direct Labour	**3**
Indirect Manufacturing Expense 60% of which is fixed	**10**
Total	**19**

A one-time only special order offering to buy 50,000 units was received from an overseas distributor. The only other costs that would be incurred on this order would be ` 4 per unit for shipping. AP has sufficient existing capacity to manufacture the additional units. In negotiating a price for the special order, AP should consider that the minimum selling price per unit should be

A. ` 17

B. ` 19

C. ` 21

D. ` 23

Workings

Relevant Costs for the Special Order

Direct Materials = `6

Direct Labour = `3

40% of Indirect Manufacturing Expense = 4

Shipping Costs = `4

Total = (6 + 3 + 4 + 4) = `17

Question 162 : -

In cost plus pricing, the markup consist of

A. Manufacturing cost

B. Desired ROI

C. Selling and administrative cost

D. Total cost and desired ROI

Question 163 : -

MN paid ` 5,30,000 for a machine used to powder wheat. The machine can be sold for ` 1,30,000. The sale value of wheat is ` 8,00,000 and its variable cost is ` 4,00,000. The opportunity cost of producing wheat flour is

A. ` 530,000

B. ` 1,30,000

C. ` 3,50,000

D. ` 8,00,000

Explanatory Comment:

The next best alternative to producing wheat flour is selling the machine i.e.. for ` 1,30,000, which is the opposite cost of producing wheat.

Question 164 : -

A Ltd. Plans to introduce a new product and issuing the target cost approach. Projected sales revenue is ` 90,00,000 (` 45 per unit) and target costs are ` 64,00,000. What is the desired profit per unit?

A. ` 13

B. ` 17

C. ` 32

D. ` 10

Workings

Sales Revenue	= ` 90,00,000
Price per Unit	= ` 45
Number of Units	= (90,00,000 ÷ 45) = 2,00,000

Target Costs = ` 64,00,000

Cost per Unit = (64,00,000 ÷2,00,000) = ` 32

Desired Profit per Unit = (45 – 32) = ` 13

Question 165 : -

Target costing is the answer to

A. Market driven prices

B. Sellers' market

C. No Profit situation

D. None of the above

Question 166 : -

The product of XYZ company is sold at a fixed price of ` 1,500 per unit. As per company's estimate, 500 units of the product are expected to be sold in the coming year. If the value of investments of the company is ` 15 lakhs and it has a target ROI of 15%, the target cost would be:

A. ` 930

B. ` 950

C. ` 1050

D. ` 1130

Workings

Target ROI at 15% of total investment of ` 15 lakhs

= ` 15,00,000 × 0.15

= ` 2,25,000

Expected output = 500 units Target Profit per unit of output = ` 2,25,000/500

= ` 450 per unit

Target cost per unit = Selling Price – Profit per unit

= ` 1,500 – ` 450

= ` 1,050 per unit.

Question 167 : -

A company has the capacity of producing 80000 units and presently sells 20000 units at ` 100 each. The demand is sensitive to selling price and it has been observed that with every reduction

of ` 10 in selling price the demand is doubled. What should be the target cost if the demand is doubled at full capacity and profit margin on sale is taken at 25%?

A. ` 75

B. ` 90

C. ` 25

D. ` 60

Workings:

Particulars	Price (`)	Demand (Units)
As at present	100	20,000
Reduction of price by ` 10	(100 – 10) 90	(20,000 × 2) 40,000
Reduction of price by another ` 10	(90 – 10) 80	80,000 (Full Capacity (40,000 × 2)

Therefore, at full capacity of 80,000 units:

Selling Price = ` 80

Target Profit = 25% of Selling Price

= 25% of 80

= ` 20

Target Cost = (Selling Price – Profit)

= (80 – 20)

= ` 60

Answer:

1	**C**	**2**	**D**	**3**	**D**	**4**	**A**	**5**	**B**	**6**	**B**
7	**C**	**8**	**B**	**9**	**B**	**10**	**B**	**11**	**D**	**12**	**B**
13	**B**	**14**	**C**	**15**	**A**	**16**	**C**	**17**	**A**	**18**	**A**
19	**B**	**20**	**B**	**21**	**A**	**22**	**A**	**23**	**C**	**24**	**D**

Question 168 : -

P operates an activity-based costing (ABC) system to attribute its overhead costs to cost objects. In its budget for the year ending 31st March 2022, the company expected to place a total of 2,895 purchase orders at a total cost of ` 1,10,010. This activity and its related costs were budgeted to occur at a constant rate throughout the budget year, which is divided into 13

four-week periods. During the four-week period ended 30 June 2021, a total of 210 purchase orders were placed at a cost of ` 7,650. The over- recovery of these costs for the four-week period was:

A. ` 330

B. ` 350

C. ` 370

D. ` 390

Workings

Cost driver rate = Budgeted cost of orders ÷ Budgeted number of orders

= `1,10,010 ÷2895 = `38 for each order Cost recovered for 210 orders = 210 × `38 = `7,980 Actual costs incurred = `7,650

Over-recovery of costs for four-week period = 7980 - 7650 = ` 330

Question 169 : -

A company manufactures and sells packaging machines. It recently introduced activity-based costing to refine its existing system. Each packaging machine requires direct materials costs of ` 50,000; 50 equipment parts; 12 machine hours; 15 assembly line hours and 4 inspection hours. The details about the cost pools, allocation bases and allocation rates are given below:

Indirect cost pool	Cost allocation base	Budgeted allocation rate
Material handling Machining Assembly Inspection	No. of component parts Machine hours Assembly line hours Inspection hours	` 8 per part ` 68 per machine hour ` 75 per assembly hour ` 104 per inspection hour

The company has received an order for 40 can-packaging machines from a customer. Using activity- based costing, indirect costs allocated to the order of the customer would be:

A. `1,30,850

B. `1,25,280

C. `1,15,050

D. `1,10,280

Workings

Indirect Costs per Packaging Machine

Indirect cost pool	Cost allocation base	Allocation rate	Workings
Material handling	50 comp. parts	` 8 per part	50 × 8 = 400
Machining	12 Machine hours	` 68 per mach.hr.	12 × 68 = 816
Assembly	15 Asly. line hours	` 75 per asly. hr.	15 × 75 = 1125
Inspection	4 Inspection hours	` 104 per ins.hr.	4 × 104 = 416
Total			**` 2,757**

Therefore, for 40 machines the indirect cost = 40 × `2757= `1,10,280

Question 170 : -

Process of Cost allocation under Activity Based Costing is

A. Cost of Activities → Activities → Cost Driver → Cost allocated to cost objects

B. Cost Driver → Cost of Activities → Cost allocated to cost objects → Activities

C. Activities → Cost of Activities → Cost Driver → Cost allocated to cost objects

D. Activities → Cost Driver → Cost allocated to cost objects → Cost of Activities

Question 171 : -

At KL Company, cost of personnel department has always been charged to production department based upon number of employees. Recently, opinion gathered from the department managers indicate that number of new hires might be better predictor of personnel cost,

Total personnel department cost are ` 2,00,000.

Department	A	B	C
Number of employees	30	270	100
The number of new hires	8	12	5

Question 172 : -

If number of new hires is considered the cost driver, what amount of cost will be allocated to Department A?

A. ` 15,000

B. ` 64,000

C. ` 72,000

D. ` 40,000

Workings

Total Cost of Personnel Department = ` 2,00,000

Total No. of New Hires – 8 + 12+ 5 = 25

Personnel Cost per New Hire = 2,00,000 ÷ 25 = ` 8000

Total Cost allocated to Department A = ` 8000 × 8 = ` 64,000

Question 173 : -

Cost Driver is

A. Grouping of costs on a particular activity which drives them
B. Item for which cost measurement is required.
C. Elements that would cause a change in the cost activity.
D. All of the above

Question 174 : -

ABC Management

A. Accurately identifies sources of profit and loss
B. Assigns costs using measure of service consumed
C. Recognizes the casual relationship of cost drivers to activities
D. All of the above

Question 175 : -

Which of the following is not suitable for a JIT production system?

A. Batch production
B. Jobbing production
C. Process production
D. Service production

Explanation:

Batch production uses stocks to supply customers whilst other products are being produced. Stocks are avoided in a JIT system. Jobbing production makes products to customer order and is ideal for JIT.

Question 176 : -

Kanban Japanese System under JIT approach ensures that

A. Continuous supply of inventory or product
B. Minimum & maximum level of stock to be maintained
C. Inventory valuation
D. All of the above

Question 177 : -

JIT relates to

A. Time Management
B. Inventory and product handling
C. Delivery systems
D. None of the above

Question 178 : -

Glasso, a manufacturer of large windows, is experiencing a bottleneck in its plant. Setup time at one of its workstations has been identified as the culprit. A manager has proposed a plan to reduce setup time at a cost of ` 7,20,000. The change will result in 800 additional windows. The selling price per window is ` 18,000, direct labour costs are ` 3000 per window, and the cost of direct materials is ` 7,000 per window. Assume all units produced can be sold. The change will result in an increase in the throughput contribution of .....

A. ` 64,00,000
B. ` 88,00,000
C. ` 56,80,000
D. ` 1,44,00,000

Workings

Selling Price per Window = ` 18000
Material Cost per window = ` 7000
Throughput contribution per window = ` 11000 (SP – Material Cost) Total through put Contribution = ` 11000 × 800 = ` 88,00,000

Question 179 : -

Cost per unit under throughput accounting and marginal costing are mainly different because

A. Labour is not considered in throughput accounting
B. Direct labour is considered fixed in throughput accounting
C. Total cost is considered in throughput accounting
D. Variable cost is considered in marginal costing

Question 180 : -

Ankit Ltd., operates throughput accounting system. The details of product A per unit are as under: Selling Price: ` 75

Material Cost: ` 30

Conversion Cost: ` 20

Time to bottleneck resources: 10 minutes

What is the throughput contribution per bottleneck resource per hour?

A. ` 270

B. ` 150

C. ` 120

D. ` 90

Workings

Throughput Contribution

= (Selling Price – Material Cost) ÷ Time on bottleneck resources.

= [(` 75 – ` 30) ÷10 minutes] × 60 = ` 270

Question 181 : -

Producing more non-bottleneck output

A. Creates more inventory, but does not increase throughput contribution

B. Creates more inventory and increases throughput contribution

C. Creates less pressure for the bottleneck workstations

D. Allows for the maximization of overall contribution

Question 182 : -

Twin Ltd. uses JIT and back flush accounting. It does not use a raw material stock control account. During September 2021, 10000 units were produced and sold. The standard cost per unit is ` 150 which includes materials of ` 60. During September 2021, ` 9,90,000 of conversion costs were incurred. The debit balance in cost of goods sold account for September 2021 is:

A. ` 14,00,000

B. ` 14,80,000

C. ` 15,90,000

D. ` 16,20,000

Workings

Standard Material Cost = (10,000 × ` 60) = ` 6,00,000

Actual Conversion Cost = ` 9,90,000

Debit Balance of COGS = (Material Cost + Conversion Cost)
= 6,00,000 + 9,90,000
= 15,90,000

Question 183 : -

The companies that would benefit from back-flush costing include companies

A. Which have fast manufacturing lead time
B. Whose inventory vary from period to period
C. Companies that require audit trails
D. None of these

Question 184 : -

Bench marking is

A. A continuous process
B. The practice of setting targets using external information
C. Method to provide performance assessment
D. All of the above

Question 185 : -

S Ltd. recently sold an order of 50 units having the following costs:

	(`)
Direct materials	1,500
Direct labour (1000 hours @ `8.50):	8,500
Variable overhead (1000 hours @ `4.00)1:	4,000
Fixed overhead2:	1,400
Total:	15,400

1. Allocated on the basis of direct labour-hours.
2. Allocated at the rate of 10% of variable cost.

The company has now been requested to prepare a bid for 150 units of the same product. If an 80% learning curve is applicable, S Ltd.'s total cost on this order would be:

A. ` 38,500

B. ` 37,950
C. ` 26,400
D. ` 31,790

Workings:

Production (Units)	Labour Hours for 50 units	Total Hours
50	1000	1000 × 1 = 1000
100	80% of 1000 = 800	800 × 2 = 1600
200	80% of 800 = 640	640 × 4 = 2560

Therefore, Direct Labour Hours for 150 units

= (Total Hours for 200 units – Total Hours for 50 units)

= (2560 – 1000) = 1,560

Estimate for 150 units

1. Variable Cost (`)
   (i) Direct materials @ ` 30/- per unit: 4,500
   (ii) Direct labour (1560 hours @ ` 8.50): 13,260
   (iii) Variable overhead (1560 hours @ ` 4.00):6,240
   (iv) Total Variable Cost: 24,000
2. Fixed overhead (10% of 24,000): 2,400
3. Total: 26,400

Explanatory Comment

The problem addresses the application of the concepts of learning curve for cost estimation as also the marginal costing.

Answer:

1	A	2	D	3	C	4	B	5	C	6	D
7	A	8	A	9	B	10	B	11	B	12	A
13	A	14	C	15	A	16	D	17	C		

Question 186 : -

A manufacturing company uses two types of materials, X and Y, for manufacture of a standard product. The following information is given:

Standard Mix	Actual Mix

Material X Material Y	120 kg @ ` 5 80 kg @ ` 10 200 kg	` 600 ` 800	Material X Material Y	112 kg @ ` 5 88 kg @ ` 10 200 kg	` 560 ` 880
Less 30% Loss	60 Kg		Less 25% Loss	50 Kg	
Final Product	140 kg	` 1400	Final Product	150 kg	` 1440

Direct Materials Mix Variance is:

(a) ` 40 (fav.)

(b) ` 40 (unfav.)

(c) ` 80 (fav.)

(d) ` 80 (unfav.)

Workings:

Formula for Direct Materials Mix Variance = SP (SQ – AQ)

Direct Materials Mix Variance for X = 5(120 - 112) = 40 F

Direct Materials Mix Variance for Y = 10(80 - 88) = 80 UF

Total = 40F + 80UF = 40 UF

Question 187 : -

The information relating to the direct material cost of a company is as follows:

Standard price per unit ` 7.20

Actual quantity purchased in units 1600

Standard quantity allowed for actual production in units 1450

Material price variance on purchase (Favourable) ` 480 What is the actual purchase price per unit?

(a) ` 7.50

(b) ` 6.40

(c) ` 6.5

(d) ` 6.90

Workings:

Material Price Variance (MPV) = Standard cost of Actual Quantity - Actual Cost

480 = 7.20 × 1,600 - Actual Cost

or, Actual Cost = 11,520 - 480

or, Actual Cost = 11,040

Actual Price per Unit = 11,040 ÷ 1,600 = ` 6.90.

Question 188 : -

In a factory where standard costing system is followed, the production department consumed 1100 kgs of a material @ ` 8 per kg for product X resulting in material price variance of ` 2200 (Fav) and material usage variance of ` 1000 (Adv). What is the standard material cost of actual production of product X?

(a) 11,000

(b) 20,000

(c) 14,000

(d) 10,000

Workings:

Actual Cost = 1100 kgs × ` 8 = 8,800

Material Cost Variance = 2200 F + 1000 A = 1200F

Standard Cost = Actual Cost + Material Cost Variance

= 8,800 + 1,200 = 10,000

Question 189 : -

AB Ltd. uses standard cost system. The following information pertains to direct labour for Product X for the month of March, 2020:

Standard rate per hour = ` 8

Actual rate per hour = ` 8.40

Standard hours allowed for actual production = 2000 hours

Labour Efficiency variance = ` 1,600 (Adverse)

What were the actual hours worked?

(a) 1,800

(b) 1,810

(c) 2,200

(d) 2,190

Workings:

Labour Efficiency Variance = (ST – AT) × SR

or,

(–) ` 1,600 = (2,000 – AT) × ` 8

(-) 1600 = 16000 – 8AT

(-) 17,600 = (-) 8 AT

AT = 17,600 ÷ 8 = 2,200 hours

Question 190 : -

Aderholt uses activity-based costing to allocate its overheads. The budgeted cost/expected for the Supervisor cost pool was:

Budgeted units	5,000
Number of employees	75
Budgeted Cost	` 7,500
The actual costs incurred were:	
Actual Units	5,500
Actual Employees	77
Actual cost	` 8,085

What was the total variance for the **pool**?

(a) ` 585 Adverse

(b) ` 165 Favourable

(c) ` 5550 Favourable

(d) ` 385 Adverse

Workings:

Standard Quantity (SQ) = 75 employees ÷ 5,000 units × 5,500 units = 82.5 employees

Standard Price (SP) = 7500 ÷75 employees = 100

Standard Cost (SQ × SP) = 82.5 × 100 = 8,250

Actual cost = 8,085

Variance = 8250 - 8085 = 165 F

Question 191 : -

The following figures are extracted from the books of a company:

Budgeted O/H ` 10,000 (Fixed ` 6,000, Variable ` 4,000)

Budgeted Hours 2000

Actual O/H ` 10,400 (Fixed ` 6,100, Variable ` 4,300)

Actual Hours 2100

Variable O/H cost variance and Fixed O/H cost variance will be:

(a) 100 (A) and 200 (A)

(b) 100 (F) and 200 (F)

(c) 100 (A) and 200 (F)

(d) 200 (A) and 100 (F)

Workings:

Overhead Recovery Rate = Budgeted OH ÷ Budgeted Hours = ` 2 per hour

Variable O/H Cost variance = Recovered O/H - Actual O/H

= 4200 – 4300 = 100(A)

Fixed O/H Cost variance = 6300 - 6100 = 200 (F)

Question 192 : -

XYZ Ltd is a manufacturing company involved in the production of automobiles. Information from its last budget period is as follows:

Actual production 2, 75,000 Units

Budgeted Production 2, 50,000 Units

Actual fixed production Overheads ` 52, 60, 00,000

Budgeted fixed production Overheads ` 50, 00, 00,000

Then fixed overhead volume variance and expenditure variance will be:

(a) ` 5,00,00,000 (A)

(b) ` 5,00,00,000 (F)

(c) ` 5,00,00,000 (F)

(d) ` 5,00,00,000 (A)

Question 193 : -

A company uses standard absorbing costing. The following information is recorded by the company for October:

Output and sales	8700	8200
Selling Price per unit	` 26	` 31
Variable Cost per unit	` 10	` 10

Total Fixed Overheads	` 34800	` 37000

The sales price variance for October was:

(a) 38500 (A)

(b) 38500 (F)

(c) 41000 (A)

(d) 41000 (F)

Workings:

Sales Price Variance = Actual Quantity × (Actual Price – Standard Price)

= 8200 (31-26)

= ` 41000 (F)

Question 194 : -

Which of the following may be the cause of Material Price Variance?

(a) Change in quantity of purchase or uneconomical size of purchase order.

(b) Failure to take advantage of off-season price or failure to purchase when price is cheaper.

(c) Change in basic purchase price of material.

(d) All of the above

Question 195 : -

Variance analysis involves breaking down and analysing the total variance to explain

(a) How much of the variance is caused by using the resources that are different from the standards, i.e., the quantity variance.

(b) How much of the variance is caused by using the cost of the resources being different from the standards, i.e., the rate variance.

(c) All of the Above.

(d) None of the above

Question 196 : -

A standard costing system consists of the following key elements

(a) Setting standards for each of the operations.

(b) Comparing the actual performance with the standard performance.

(c) Analyzing and reporting variances arising from the difference between actual and standard performance.

(d) All of the Above.

Question 197 : -

Which of the following statements is correct?

(a) Standard costing facilitates the integration of accounts so that reconciliation between cost accounts and financial accounts may be eliminated.

(b) Standard costs are planned costs determined on a scientific basis and they are based upon certain assumed conditions of efficiency and other factors.

(c) Standard costing is defined as the preparation and use of standard cost, their comparison with actual cost and the measurement and analysis of variances to their cause and points of incidence.

(d) All of the above.

Question 198 : -

Which of the following statements is true?

(a) If the actual cost is more than the standard, we call it adverse variance and if the difference is less than the standard, we call it favourable variance.

(b) In case of sales and profit, if the standard is more than actual, it is adverse variance and if the standard is less than the actual, it is favourable variance.

(c) Both (a) and (b).

(d) None of the above.

Question 199 : -

Standard cost and budgeted cost are

(a) Interrelated but not interdependent.

(b) Interdependent but not interrelated.

(c) Interrelated and interdependent.

(d) None of the above.

Question 200 : -

Efficiency Ratio is

(a) Available working days ÷ Budgeted working days × 100

(b) Budgeted hours ÷ Maximum hours in budgeted period × 100

(c) Standard hours ÷ Actual hours × 100

(d) None of the above

Question 201 : -

Uniform Costing may not be successfully applied in the following case:

(a) In a single enterprise having a number of branches, each of which manufactures the same set of products with the same facilities.

(b) In a number of entities in the same industry bound by a trade association.

(c) In a number of units across different geographical locations manufacturing one or more of a given set of products.

(d) In different branches of the same company, each branch making a different product using a unique process.

Explanatory Comment

Though the entity is the same, different products using different (unique) process cannot follow uniform costing.

Answer

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	D	D	C	B	C	C	D	D	C	D	D	C	A	B	D

LPP

Question 202 : -

A constraint in an L.P. Model restricts

a. Value of the Objective Function.

b. Values of the Decision Variables

c. Use of the available resources

d. All the above

Question 203 : -

In graphical method of solution of LPP if the Iso-cost line coincide with a side of the Feasible Region then we get –

a. Unique optimum solution.
b. Unbounded optimum solution.
c. No feasible solution.
d. Infinite number of optimum solutions.

Question 204 : -

A feasible solution of LPP –

a. Must satisfy all the constraints simultaneously.
b. Need not satisfy all the constraints, only some of them.
c. Must be a corner point of the feasible region
d. All the above.

Question 205 : -

The Objective Function of a LPP is $Z = 3x_1 + 2x_2$. If $x_1 = 10$ and $x_2 = 5$ then the value of Z is –

a. 35
b. 40
c. 45
d. 50

Question 206 : -

Multiple solution exist in a Linear Programming problem when –

a. One of the constraints is redundant
b. Objective Function is parallel to one of the constraints
c. Two constraints are parallel
d. All of the above

Question 207 : -

The linear function of the variables which is to be optimized is called –

a. Constraints
b. Objective Function
c. Decision variables
d. None of the above

Question 208 : -

If the value of the Objective Function can be increased or decreased indefinitely then the solution is called –

a. Unbounded
b. Bounded
c. Infeasible
d. None of the above

Question 209 : -

The first step in formulating a LPP is –

a. Identify the upper and lower boundaries of the decision variables
b. State the constraints as linear combinations of the decision variables
c. Understand the problem
d. Identify the Decision Variables

Question 210 : -

The best use of Linear Programming is to find the optimal use of –

a. Manpower
b. Material
c. Money
d. All of the above

Question 211 : -

Which of the following is assumption of Linear Programming Model?

a. Divisibility
b. Proportionality
c. Additivity
d. All of the above

Question 212 : -

Non-negativity condition of Linear Programming implies –

a. A positive coefficient of variables in Objective Function.
b. A positive coefficient of variables in any constraint.
c. Non-negative value of resource.
d. None of the above.

Question 213 : -

If the constraints of a Linear Programming problem are $x_1 + x_2 \leq 1$, $3x_1 + x_2 \geq 3$ and $x_1 , x_2 \geq 0$ then –

a. There are two feasible regions
b. There are infinite feasible regions
c. No feasible region
d. None of the above

Question 214 : -

For any LPP the intermediate solutions must be checked by substituting them back into the

a. Objective Function
b. Constraints
c. Either of (a) and (b)
d. This is not required.

Question 215 : -

The feasible solution of any LPP should belong to –

a. Both first and second quadrant
b. Only first quadrant
c. Only second quadrant
d. Both first and third quadrant

Question 216 : -

The true statement related to the graphs of $3x_1 + 2x_2 \leq 5$ and $6x_1 + 4x_2 > 10$ is –

a. Both the graphs are disjoint.
b. Both contain the point (1,1)
c. Both (a) and (b) above are true
d. Both (a) and (b) are not true simultaneously

Question 217 : -

In which quadrant the bounded region of the inequalities $x_1 + x_2 \leq 1$ and $x_1 - x_2 \leq 1$ is situated?

a. First and third
b. Second and third
c. First and second
d. All the four quadrants

Question 218 : -

Objective function of LPP is –

a. A relation between the variables
b. A function to be optimized
c. A constraint
d. None of the above

Question 219 : -

The optimal value of the Objective Function is attained at the poinrs

a. Given by intersection of inequations with axes only
b. Given by intersection of inequations with x axis only
c. Given by intersection of inequations with y axis only
d. Given by corner points of the feasible region.

Question 220 : -

If the constraints in a Linear Programming problem are changed then –

a. The problem is to be re-evaluated.
b. Solution is not defined
c. The Objective Function has to be modified.
d. The change in constraints is to be ignored.

Question 221 : -

The constraints $y - x \leq 1$, $3y - x \leq 9$ and $x, y \geq 0$ are defined on

a. Bounded feasible space
b. Unbounded feasible space
c. Redundant space
d. None of the above.

Question 222 : -

Which of the terms is not used in Linear Programming?

a. Slack variables
b. Objective function
c. Concave region
d. Feasible region

Question 223 : -

The area of the Feasible Region of the constraints $3x_1 + x_2 \geq 3$, $x_1 \geq 0$ and $x_2 \geq 0$ is –

a. Bounded
b. Unbounded
c. Convex
d. Concave

Question 224 : -

For the LPP, Minimize $Z = x + y$ subject to the constraints $5x + 10y \leq 0$, $x + y \geq 1$, $y \leq 4$, $x \geq 0$ and $y \geq 0$

a. There is a bounded solution
b. There is no solution
c. There are infinite solutions
d. None of the above

Question 225 : -

In a Linear Programming Problem –

a. Objective Function is linear.
b. Constraints are linear.
c. Both Objective Function and Constraints are linear.
d. None of the above

Question 226 : -

Constraints mean –

a. Limitations are expressed in the form of mathematical inequalities or equalities.
b. Assumption
c. Goal to be achieved
d. None of the above

Question 227 : -

The region which satisfies all the constraints of LPP is known as –

a. Phisible region
b. Convex region
c. Feasible region
d. Concave region

Question 228 : -

In LPP while drawing the graph, y values on x axis are always –

a. 1

b. 0

c. -1

d. All of the above

Question 229 : -

The set of decision variables which satisfies all the constraints of LPP is called –

a. Solution

b. Basic solution

c. Feasible solution

d. None of the above

Question 230 : -

The value of the Objective Function is maximum under linear constraints –

a. At the centre of Feasible Region

b. At the origin

c. At a vertex of the Feasible Region

d. At the vertex of the Feasible Region which is farthest from the origin.

Question 231 : -

A solution which optimizes the Objective Function is called –

a. Solution

b. Basic solution

c. Feasible solution

d. Optimal solution

Answers

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
c	b	a	b	b	b	a	d	d	d	c	c	d	b	a
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
d	b	d	a	b	c	b	a	d	a	c	b	c	d	d

B. NUMERICAL QUESTIONS

Comprehensive Numerical Problems

1. An investor is well aware of the fact that maximization of total return on investment is best possible if the help of Linear Programming technique is taken. For that he has employed you and provided with the following information about his various activities of money making.

   Activity A_1 – Invest in Bank Fixed Deposit schemes, Activity A_2 – Invest in Government Bonds, Activity A_3 – Invest in Midcap Mutual Funds and Activity A_4 – Invest in Equity linked Mutual Funds.

   Total amount to be invested – ` 5 lakhs

   To avoid excessive investment, not more than 50% of the total should be invested in Government Bonds and Midcap Mutual Funds.

   Investment in Bank Fixed Deposits is very conservative way of money making, while Investment in Equity linked Mutual Funds is very speculative. To avoid excessive speculation, at least ` 1 must be invested in Fixed Deposits for every ` 3 invested in Equity linked Mutual Funds.

   Data on the ROI of the different activities are as follows –

Activity	**A_1**	**A_2**	**A_3**	**A_4**
Return on Investment,	4%	5.5%	7%	10%

   To solve the problem the investor has provided you with software. But you have to arrange for formulating the mathematical model of the problem and subsequent data feeding to use the software. Explain clearly your first step.

2. For a manufacturing company the following data are relevant to its products A and B

Description	**Product A**	**Product B**
1) Selling price per unit in Rupees	200	240
2) Cost per unit in Rupees		
2.1) Direct materials	45	50
2.2) Direct wages in		
Department 1	16	20
Department 2	22.50	15.50
Department 3	10/-	30/-
2.3) Variable Overhead	6.50/-	11.50/-
3) Hours required per unit in		
Department 1	8	10
Department 2	10	6
Department 3	4	12

   Also it is given that the number of employees in the Departments 1, 2 and 3 are respectively

20, 15 and 18 as well as the maximum available hours per employee per week for each of the three departments is 40. Formulate the linear programming problem so that the contribution of the company is maximized.

3. A company buying scrap metal has two types of scrap available to them. The first type of scrap has 20% of Metal A, 10% impurity and 20% of Metal B by weight. The second type of scrap has 30% of Metal A, 10% impurity and 15% of Metal B by weight. The company requires at least 120 kgs. of Metal A, at most 40 kgs. of impurity and at least 90 kgs. of Metal B. The price for the two scraps are ` 200 and ` 300 per kg. respectively. Determine the optimum quantities of the two scraps to be purchased by the company so that the requirements of the two metals and the restriction on impurity are satisfied at minimum cost. Use graphical method.
4. An engineering company dealing with Combustion Equipment and Furnaces is planning its advertising strategy. They have two monthly industrial magazines under consideration. The first magazine has a reach of 2000 potential customers per advertisement and the second magazine has a reach of 3000 potential customers per advertisement. Respective cost per advertisement of the two magazines are ` 6000 and ` 9000 and the firm has a monthly budget of ` 1 lakh. There is an important requirement that the total reach for the business group having annual turnover below ` 20 Crores must not exceed 3000 potential customers. The reach of the two magazines having such business group customers are respectively 300 and 150 potential customers per advertisement. How many times the company should advertise in the two magazines to maximize the total reach? Solve graphically.
5. A Factory manufactures 3 products which are processed through 3 different production stages. The time required to manufacture one unit of each of the three products and the daily capacity of the stages are given in the following table:

Stage	Time per unit in minutes			Stage capacity (minutes)
	Product 1	Product 2	Product 3	
1	1	2	1	430
2	3	-	2	460
3	1	4	-	420
Profit per unit (`)	3	2	5	

Set the data in a Simplex Table and find the optimal solution.

6. Obtain the Dual from the following Primal.

Minimize $Z = x_1 - 3x_2 - 2x_3$ Subject to the Constraints $3x_1 - x_2 + 2x_3 \leq 7$

$2x_1 - 4x_2 \geq 12$

$-4x_1 + 3x_2 + 8x_3 = 10$

$x_1 \geq 0$, $x_2 \geq 0$ and x_3 is unrestricted in sign.

7. A company makes three products X, Y and Z using the raw materials A, B and C, Requirement of raw materials for each of the products X, Y and Z are given below.

   Each of Product X requires 1 unit of raw material A, 2 units of B and 2 units of C. Each of Product Y requires 2 units of raw material A, 1 unit of B and 5 units of C. Each of Product Z requires 1 unit of raw material A, 4 units of B and 1 unit of C.

   Find the optimum product mix when it is given that each unit of X, Y and Z gives profit of `40, `25 and `50 respectively. Write the Dual of the given problem. Using the optimum solution of the Primal problem, write the solution of the Dual and interpret it.

Answer:

1. Mathematical formulation of the given LPP would be the first step and that is given as follows.

   Maximize $Z = 0.04x_1 + 0.055x_2 + 0.07x_3 + 0.10x_4$ (x_i is the amount invested in Activity A_i and i = 1, 2, 3, 4)

   Subject to the constraints

   $x_1 + x_2 + x_3 + x_4 \leq 500000$, $-0.5x_1 + 0.5x_2 + 0.5x_3 - 0.5x_4 \leq 0$, $3x_1 - x_4 \geq 0$ & $x_1, x_2, x_3, x_4 \geq 0$

2. Maximize Z = 100x + 115y (x and y are the number of Products A and B are to be manufactured)

   Subject to the constraints

   $8x + 10y \leq 800$, $10x + 6y \leq 600$, $4x + 12y \leq 720$ & $x, y \geq 0$.

3. The solution is infeasible.

4. The problem has multiple optimum solution with maximum value of Objective Function = 100000/3.

5. Maximum Profit = ` 1350

   No. of units of Product 1 to be produced = 0 No. of units of Product 2 to be produced = 100

   No. of units of Product 1 to be produced = 230

6. Maximize $Z^* = -7y_1 + 12y_2 + 10y_3$ Subject to the constraints

   $-3y_1 + 2y_2 + 4y_3 \leq 1$

   $y_1 - 4y_2 + 3y_3 \leq -3$

   $2y_1 - 8y_3 = 2$

   $y_1 \geq 0$, $y_2 \geq 0$ and y_3 is unrestricted in sign

7. Optimum Product Mix is X = 20 Units, Y = 0 and Z = 5 Units and Maximum Profit = ` 1050

Dual is given as

Minimize $Z^* = 36P + 60Q + 45R$

Subject to the constraints

$P + 2Q + 2R \geq 40$ $2P + Q + 5R \geq 25$ $P + 4Q + R \geq 50$ P, Q & $R \geq 0$

From the optimum solution of the Primal problem, the solution of the Dual is given as P = 0, Q = 10 & R = 10 and $Z^* = 1050$

Final table of the Primal problem indicates that the marginal value of the raw material A = 0, B = ` 10 per unit and C = ` 10 per unit respectively. Thus instead of making the products X, Y and Z and selling, if the raw materials A, B and C are sold at the above rates then also the same contribution of ` 1050 can be achieved.

TRANSPORTATION

Question 232 : -

Which of the following considers difference between least cost and the cost just before least for each row and column while finding Basic Feasible Solution in Transportation?

(a) North West Corner Method

(b) Least Cost Method

(c) Vogel's Approximation Method

(d) Both (b) and (c) above

Question 233 : -

When the total allocation of a Transportation Problem match with supply and demand values, the solution is –

(a) Non-degenerate

(b) Feasible

(c) Degenerate

(d) None of the above

Question 234 : -

The solution to a Transportation Problem with 'm' sources ad 'n' destinations is feasible if the number of cell allocations are –

(a) m + n

(b) mn

(c) m – n -1

(d) m + n – 1

Question 235 : -

To resolve Degeneracy in the solution of a Transportation Problem an infinitely small allocation is made to the solution already obtained. This allocation is known as –

(a) Dummy

(b) Epsilon

(c) ε – the Greek letter

(d) All of the above except (a)

Question 236 : -

Which of the following is not correct with respect to Transportation as a tool of Quantitative Technique?

(a) Transportation technique is a special case of LP.

(b) Transportation technique might give rise to solutions which are degenerate.

(c) No Transportation problem can be given with supply ≠ demand.

(d) Using Transportation technique one can maximize an Objective Function.

Question 237 : -

Which of the following method is used to test optimality of a solution in Transportation?

(a) Modified Distribution

(b) Simplex

(c) VAM

(d) LCM

Question 238 : -

In a solution of Transportation problem, empty cells are called –

(a) Unoccupied cells

(b) Unallocated cells

(c) Empty cells

(d) All of the above

Question 239 : -

The Transportation Problem deals with the transportation of –

(a) Single product from a source to several destinations

(b) Several products from a source to a destination.

(c) Single product from several sources to a destination.

(d) Single product from several sources to several destinations.

Question 240 : -

In NWCM, first allocation is made at –

(a) Upper left hand corner of the table.

(b) Lower right hand corner of the table.

(c) Upper right hand corner of the table.

(d) Lower left hand corner of the table.

Question 241 : -

One of the disadvantages of North West Corner rule for finding Initial Feasible Solution of Transportation problem is –

(a) It is complicated to use

(b) It leads to non-optimal solution

(c) It does not take into account unit cost of transportation.

(d) Generally it provides degenerate solution.

Question 242 : -

When total demand and supply are equal then the Transportation problem is said to be –

(a) A problem having multiple optimum solutions.

(b) A problem having degeneracy.

(c) A balanced one.

(d) None of the above.

Question 243 : -

Which one of the following is correct?

(a) The dummy source or destination is used in a Transportation problem to resolve degeneracy.

(b) The dummy source or destination is used in a Transportation problem to make it balanced.

(c) The dummy source or destination is used in a Transportation problem to ensure its cost effectiveness.

(d) All the above statements are correct.

Question 244 : -

For solving a maximization problem by Transportation algorithm, the very first step is to –

(a) Subtract smallest cost element of the matrix from all the other cost elements.

(b) Subtract all the cost elements of the matrix from the highest element of the same.

(c) Add smallest cost element of the matrix to all the other cost elements.

(d) Add highest cost element of the matrix to all the other elements.

Question 245 : -

Which of the following methods is used for finding an initial feasible solution of a Transportation Problem?

(a) Simplex

(b) Least Cost

(c) Hungarian

(d) Big M

Question 246 : -

Which of the following is a method for improving an initial solution of a Transportation problem?

(a) Stepping Stone

(b) North West Corner

(c) Intuitive Lowest Cost

(d) All of the above

Question 247 : -

Basic Feasible Solution for a Transportation problem is given as follows –

To	Warehouse		Supply
From	W_1	W_2	
A	5 / (10)	7	10
B	8 / 15	9 / (25)	40
Demand	25	25	50

Given, the Unit Transportation Costs are in Rupees. Can this solution be improved?

(a) Yes the solution can be improved by ` 50

(b) Yes the solution can be improved by ` 100

(c) No the solution is optimal

(d) Yes the solution can be improved by ` 10.

Question 248 : -

The Initial Feasible Solution of a Transportation Problem can be obtained by different methods. The only restriction is that –

(a) The edge constraints of supply and demand are satisfied.

(b) The solution must be obtained using VAM.

(a) The solution should be non-degenerate.

(b) All of the above.

Question 249 : -

The purpose of Stepping Stone Method is to –

(a) Facilitate moving from a feasible solution to an optimal solution.

(b) Test optimality of a solution.

(c) Both the two above.

(d) None of the above.

Question 250 : -

Which one of the following is the purpose of a dummy source or dummy destination in a Transportation Problem?

(a) To convert the problem from unbalanced to balanced.

(b) To make the solution non-degenerate.

(c) To provide a means of a dummy problem.

(d) To make sure that the total cost is not exceeding a predetermined figure.

Question 251 : -

An important assumption of Transportation technique is –

(a) There is only one optimal solution for each problem

(b) There are no economies of scale if huge quantities are transported from one source to one destination.

(c) The number of dummy sources and destinations must be equal.

(d) None of the above.

Question 252 : -

The equation $C_{ij} = u_i + v_j$ is used to calculate –

(a) An improvement index for the Stepping Stone Method.

(b) The MODI cost values u_i and v_j

(c) The Degeneracy index.

(d) None of the above

Question 253 : -

For an unbalanced problem of Transportation, the cost coefficients for each of the created cells is –

(a) Very high positive value

(b) Very high negative value

(c) Zero

(d) One

Question 254 : -

A degenerate solution of a Transportation Problem means –

(a) Total supply is not equal to the total demand.

(b) Some allocations have become negative.

(c) The obtained solution is not feasible.

(d) Both (a) and (b) but not (c).

Question 255 : -

Multiple optimum solutions exist for a Transportation Problem when –

(a) There is at least one unoccupied cell of the obtained optimal solution which has zero opportunity cost.

(b) There is unused route of Transportation having all the cells with positive opportunity cost.

(c) There is unused route of Transportation with further scope of reducing total cost of transportation.

(d) There is one and only one unoccupied cell of the obtained optimal solution with zero opportunity cost.

Question 256 : -

In an iteration while moving from one solution to the next, degeneracy occurs when –

(a) The closed loop indicates a diagonal move.

(b) Two or more of the allocated cells in the closed loop with minus sign have same lowest allocation.

(c) Two or more allocated cells are on the closed loop but neither of them represent a corner of the loop.

(d) Either one of the above

Question 257 : -

Left hand side of the equation $\Delta_{ij} = C_{ij} - (u_i + v_j)$ is known as –

(a) Opportunity Cost

(b) Improvement Index

(c) Both (a) and (b)

(d) None of the above

Question 258 : -

The highest negative opportunity cost value in an unused cell of a Transportation Matrix is chosen to improve the current solution because –

(a) It represents maximum possible cost reduction per unit

(b) It ensures no violation of Rim Condition.

(c) It represents per unit cost improvement.

(d) Either one of the above.

Question 259 : -

Which of the following statements is best suited to the Transportation solution given below?

To / From	Warehouse W_1	Warehouse W_2	Warehouse W_3	Supply
A	3 (20)	5 (50)	9	70
B	5	4 (30)	7	30
C	10 (40)	8	3 (80)	120
Demand	60	80	80	220

(a) The solution is degenerate.

(b) The solution can be improved by shipping from C to W_2

(c) The solution can be improved by shipping from B to W_1

(d) NWCM has been used to develop the solution.

Question 260 : -

The Total Cost of Transportation for the Solution Matrix given in the Q. No. 28 is –

(a) `1070

(b) `1130

(c) `1350

(d) `1050

Question 261 : -

Which of the following statement is true in respect of the solution of a Transportation Problem?

To / From	Warehouse W_1	Warehouse W_2	Warehouse W_3	Supply
A	25	17 (300)	25	300
B	15 (300)	10	18 (200)	500

C	0	0	0 300	300
Demand	300	300	500	1100

(a) The problem is an unbalanced one with Demand > Supply.

(b) Plant C is a Dummy Plant.

(c) Demand of Warehouse W_3 will not be completely fulfilled.

(d) All of the above.

Answers:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
c	b	d	d	c	a	d	d	a	c	c	b	b	b	a
16	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
c	a	c	a	b	b	c	c	a	b	c	a	b	a	d

A. NUMERICAL QUESTIONS:

⊙ Comprehensive Numerical Problems

1. ABC Enterprises are having three Plants, for manufacturing Dry Cells, located at three different states of the country. Production cost differs from Plant to Plant. There are four dedicated Sales Offices of the Company located at the four metro cities in the four regions of the country and a Head Office, in the capital of the country, which also takes care of sales. The Sales prices are different from one region to the other and also in the capital city. Unit Production Cost and Maximum Production Capacity of each Plant is provided in the first table below. Also provided are the data on Shipping Cost from each Plant to the different Sales Offices as well as Demand and Price at which they can sell.

   You have to find the Production and Distribution schedule which maximises the Profit of the company.

Table 1 showing Production Cost and Capacity of the Plants

Plant Number	Maximum Production Capacity	Production Cost (`)
1	150 Units	20
2	200 Units	22
3	125 Units	18

Table 2 showing Shipping Cost per unit from different Plants to various Sales Offices

	to Sales Offices at

from Plants	Northern Region	Southern Region	Western Region	Eastern Region	Capital City
1	1	1	5	9	4
2	9	7	8	3	6
3	4	5	3	2	7

Table 3 showing Demand (Units) and Selling Prices (`) for different Sales Offices

Item	for Sales Offices at				
	Northern Region	Southern Region	Western Region	Eastern Region	Capital City
Demand	80	100	75	45	125
Selling Price	30	32	31	34	29

2. A company wishes to determine an Investment Strategy for each of the next four years. Five investment types have been selected, investment capital has been allocated for each of the coming four years and maximum investment levels have been established for each investment type. An assumption is that amounts invested in a year will remain invested until the end of the planning horizon of four years. The following table summarises the data for this problem. The values in the body of the table represent net return on investment of one rupee up to the end of the planning horizon. For example a rupee invested in investment type B at the beginning of the year 1 will grow to ` 1.90 by the end of the 4th year yielding a net return of ` 0.90.

Table showing Net Return data

Investment made at the beginning of the year	Investment Type					Amount available for Investment (`000)
	A	B	C	D	E	
1	0.80	0.90	0.60	0.75	1.00	500
2	0.55	0.65	0.40	0.60	0.50	600
3	0.30	0.25	0.30	0.50	0.20	750
4	0.15	0.12	0.25	0.35	0.10	800

Maximum possible investment (` '000)	750	600	500	800	1000	

You need to determine the amount to be invested at the beginning of each year in different types of investment so as to maximize the net rupee return for the period of four years. Also find the maximum value of net return on investment.

3. Consider the problem of scheduling the weekly production of certain items for the next four weeks. The cost of production of the item is `10 for the first 2 weeks and `15 for the last 2 weeks. The weekly demands are 300, 700, 900 and 800 units, which must be met. The plant can produce maximum 700 units per week. In addition the company can employ overtime during the 2nd and 3rd week. This increases the weekly production by additional 200 units, but the production cost increases by `5. Excess production can be stored at a unit cost of `3 per week. How should the production be scheduled so as to minimize the total cost? How much production is to be carried out by overtime?

Answer:

1. Production and Distribution Schedule

from Plant	**to Sales Office**	**Number of units allocated**
1	Northern Region	50
1	Southern Region	100
2	Eastern Region	25
2	Capital City	125
3	Northern Region	30
3	Western Region	75
3	Eastern Region	20

2. Schedule of Amounts to be invested in different types of Investment in various years

Year of Investment	**Investment type**	**Amount to be invested (`000)**
1	E	500
2	B	600
3	D	750
4	A	250

4	C	500
4	D	50

Maximum net return on investment = ` 14,45,000

3. [**Hints** – As per the given condition, Available options of production in different weeks can be written down as – Normal time production for week 1, Normal time production for week 2, Overtime production for week 2, Normal time production for week 3, Overtime production for week 3 and Normal time production for week 4.

Also Cost of producing an item in Normal time for the 1st two weeks = ` 10. But if the same item is produced in a week and used in a subsequent week then there is Carrying Cost @ ` 3 per week. Hence an item produced in the 1st week and used in the 2nd week will have a cost of ` 13, in the 3rd week it will be

`16 and so on. Similarly Cost of producing an item in overtime = `15. Thus cost of using the same item in the next week = `18, in the week next to that = `21 and so on.

Thus the given information can be tabulated as follows –

Produced during week	**Cost (` per unit) when used in the week**					**Quantity available (Nos.)**
	1	**2**	**3**	**4**	**Dummy**	
1	10	13	16	19	0	700
2 (Normal)	M	10	13	16	0	700
2 (Overtime)	M	15	18	21	0	200
3 (Normal)	M	M	15	18	0	700
3 (Overtime)	M	M	20	23	0	200
4	M	M	M	15	0	700
Demand	300	700	900	800	500	3200

[As the production of 2nd week cannot be used in the 1st week, the allocation in the cell (2,1) is not possible. In other words it is a case of prohibited transportation. To take care of this restriction the cost figues in all such cells have been taken as M] Now the problem can be solved using usual technique of solving Transportation problems. The optimal schedule is given as follows –

Produced in week	**Used in week**	**Number of units**
1	1	300

1	3	200
1	4	100
1	Dummy	100
2 (Normal time)	2	700
2 (Overtime)	Dummy	200
3 (Normal time)	3	700
3 (Overtime)	Dummy	200
4	4	700

Minimum Total Cost = ` 36,100.

From the table above it is clear that overtime productions have been allocated only to the Dummy week. Hence no production in overtime is necessary. In fact there will be spare capacity of 100 units in the 1st week because this quantity of the production of 1st week is allocated to Dummy week.

ASSIGNMENT

Question 262 : -

Which of the following methods is used to solve the Assignment problems?

(a) Stepping Stone Method

(b) Hungarian Method

(c) North West Corner Method

(d) Vogel's Approximation Method

Question 263 : -

Assignment of work to men and machines is known as

(a) Scheduling

(b) Loading

(c) Balancing of Line

(d) None of these

Question 264 : -

In an Assignment matrix of size (5 × 5), the total number of decision variables in the objective function is –

(a) 10

(b) 5

(c) 25

(d) 15

Question 265 : -

An Assignment problem is solved to minimise the total time required to complete three jobs on three different machines such that each job is processed by exactly one machine and each machine processes exactly one job. The minimum total processing time is found to be 480 minutes. After a few days of operation, there has been a change in the design of the second job. Due to this, the processing time of the second job is increased by 15 minutes in either of the machines. The revised minimum total processing time will be –

(a) 495 minutes

(b) 465 minutes

(c) 480 minutes

(d) None of these

Question 266 : -

Assignment problem can be considered as a particular case of -

(a) Transportation problem

(b) Sequencing problem

(c) Queuing problem

(d) All of these

Question 267 : -

Dummy row or column is added in an assignment problem –

(a) To prevent a solution to become degenerate.

(b) To reduce the total cost of assignment.

(c) To increase the profit function.

(d) To balance total activities and total resources

Question 268 : -

While solving an assignment problem, an activity is assigned to a resource with zero opportunity cost because objective is to –

(a) Reduce total cost of assignment to zero.

(b) Reduce cost of that assignment to zero.

(c) Minimise total cost of assignment.

(d) Maximise total cost of assignment.

Question 269 : -

In an assignment problem –

(a) First activity is assigned to first resource

(b) Any number of activities can be assigned to each resource.

(c) It depends on how many resources are available.

(d) Only one activity be assigned to each resource.

Question 270 : -

An assignment problem can be viewed as a special case of transportation problem in which the capacity from each source is _____ and the demand at each destination is __.

(a) Unlimited, unlimited

(b) One, unlimited

(c) One, one

(d) Unlimited, one

Question 271 : -

In marking assignments which of the following should be preferred?

(a) Only row having single zero

(b) Only column having single zero

(c) Column having more than one zero

(d) Only row / column having single zero.

Question 272 : -

The assignment matrix is always a _____

(a) Rectangular matrix
(b) Identity matrix
(c) Square matrix
(d) None of these

Question 273 : -

Maximisation assignment problem is transformed into a minimisation problem by __

(a) Adding each entry of a column to the maximum value of that column
(b) Subtracting each entry in a column from maximum value in that column.
(c) Subtracting each entry of the table from the maximum value of the table.
(d) Adding each entry of the table to the maximum value in the table.

Question 274 : -

The assignment problem will have alternative solutions when it has __

(a) At least one zero in any row or column
(b) All rows have two zeros.
(c) Two diagonal elements are zeros
(d) None of the above.

Question 275 : -

In the Hungarian Method of solving Assignment problem, the row reduction is obtained by

(a) Dividing each row by the elements of the row above it.
(b) Subtracting the elements of the row from the elements of the row above it.
(c) Subtracting the smallest element from all other elements of the row.
(d) Subtracting all the elements of the row from the highest element in the matrix.

Question 276 : -

The horizontal and vertical lines drawn to cover all zeros of the total opportunity matrix for an optimal solution must be –

(a) Equal to m x n, where m = No. of rows & n = No. of columns.
(b) Equal to each other.
(c) Equal to m + n, where m = No. of rows & n = No. of columns
(d) Equal to the Order of the matrix.

Question 277 : -

In a problem of Travelling Salesman, the diagonal elements of the matrix from top left corner

are all –

(a) Zeros
(b) Negative
(c) Ones
(d) Infinitely large

Question 278 : -

The similarity between Assignment Problem and Transportation Problem is –

(a) Both are rectangular matrices
(b) Both are square matrices
(c) Both can be solved by graphical method
(d) Both have objective function and non-negativity constraints.

Question 279 : -

When we try to solve the Assignment problem by Transportation algorithm the following difficulty arises.

(a) There will be a tie while making allocations.
(b) The problem will get alternate solution.
(c) The problem degenerates and we have to use epsilon to solve degeneracy.
(d) The Assignment problem cannot be solved by Transportation algorithm.

Question 280 : -

The following character dictates that the Assignment matrix is a square one.

(a) The allocations in Assignment problem are one to one.
(b) Because we find row opportunity cost matrix.
(c) Because we find column opportunity cost matrix.
(d) Because after making allocations, horizontal and vertical lines are to be drawn.

Question 281 : -

An Assignment problem is considered as a special case of Transportation problem because –

(a) The number of rows is equal to the number of columns
(b) All x_{ij} = 0 or 1
(c) All rim conditions are equal to 1
(d) All of these

Question 282 : -

An Assignment problem can be solved by –

(a) Simplex method
(b) Transportation method
(c) Both (a) and (b)
(d) Only (b) but not (a)

Question 283 : -

The Hungarian Method for solving an Assignment problem can also be used to solve –

(a) Transportation problem
(b) Travelling Salesman problem
(c) Both (a) and (b)
(d) Not (a) but (b)

Question 284 : -

A firm is required to procure three items I, II & III from three vendors V_1, V_2 & V_3 respectively. The quoted prices in Rupees are given in the table below. The management policy clearly states that each item should be procured from only one vendor and each vendor should supply only one item. The minimum total cost of procurement is –

	VENDORS		
ITEMS	V_1	V_2	V_3
I	110	120	130
II	115	140	140
III	125	145	165

(a) ` 375
(b) ` 385
(c) ` 390
(d) None of the above

Question 285 : -

In a machine shop four jobs need to be assigned to four machines. Each of the jobs is to be assigned to one machine only at a time. The time in minutes required to complete different jobs in different machines is given in the table below.

	MACHINES			
JOBS	I	II	III	IV

A	15	13	14	17
B	11	12	15	13
C	13	12	10	11
D	15	17	14	16

In order to ensure that the total time to complete the jobs is minimum, the optimal assignment of the jobs is –

(a) A to IV, B to II, C to III and D to I

(b) A to II, B to I, C to IV and D to III

(c) A to II, B to I, C to III and D to IV

(d) A to IV, B to II, C to I and D to III

Question 286 : -

If there are n jobs and n workers, there would be –

(a) n! solutions

(b) (n – 1)! solutions

(c) (n!).n solutions

(d) n solutions

Question 287 : -

The Assignment problem

(a) Requires that only one activity be assigned to each resource

(b) Is a special case of Transportation problem

(c) Can be used to maximise the resources

(d) All of the above

Question 288 : -

To proceed with the MODI algorithm for solving an assignment problem, the number of dummy allocations need to be added are –

(a) n

(b) n -1

(c) 2n

(d) 2n – 1

Question 289 : -

An optimal solution of an assignment problem can be obtained only if –

(a) Each row and column has only one zero element

(b) Each row and column has at least one zero element

(c) Both the diagonals of the matrix have zero element

(d) None of the above

Question 290 : -

The procedure used to solve Assignment problems wherein one reduces the original assignment costs to a table of opportunity costs is called ___

(a) Stepping Stone Method

(b) Matrix Reduction

(c) MODI Method

(d) Northwest Reduction

Question 291 : -

When a maximisation assignment problem is converted to minimisation problem, the resultant matrix is called

(a) Cost matrix

(b) Profit matrix

(c) Regret matrix

(d) Dummy matrix

Answers

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
b	b	c	a	a	d	c	d	c	d	c	c	d	c	d
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
d	d	c	a	d	c	d	b	b	a	d	b	d	b	c

B. NUMERICAL QUESTIONS

⊙ **Comprehensive Numerical Problems**

1. A Methods Engineer wants to assign four new methods to three work centres. The assignment of the new methods will increase production and they are given in the matrix below. If only one method can be assigned to a work centre, determine the optimum assignment.

	Increase in production (Units) at the Work Centres		
Methods	**A**	**B**	**C**

1	10	7	8
2	8	9	7
3	7	12	6
4	10	10	8

Is this a problem of multiple optimum solution? If yes, then find the alternative solution/s also.

2. Consider a problem of assigning four junior assistants to four tasks. The time (hours) required to complete the tasks are given in the table below.

	TASKS			
CLERKS	A	B	C	D
1	4	7	5	6
2	-	8	7	4
3	3	-	5	3
4	6	6	4	2

Assistant 2 cannot be assigned to task A and Assistant 3 cannot be assigned to task B. Find the optimal assignment schedule.

3. A company has four zones open and four salesmen available for assignment. The zones are not equally rich in their sales potentials. It is estimated that a typical salesman operating in each zone would bring in the following annual sales in `:

Zone: A: 1,26,000: Zone B:1,05,000; Zone C: 84,000; Zone D: 63,000.

The four salesmen are also considered to differ in ability. It is estimated that working under the same condition their sales per year would be proportionately as follows:

Salesman P:7 ; Salesman Q:5; Salesman R:5; Salesman S:4. If the criterion is maximum expected total sales, the intuitive answer is to assign the best salesman to the richest zone, the next best to the second richest zone and so on. Verify this by the method of assignment.

4. Average time taken by an operator on a specific machine is tabulated below. The management is considering to replace one of the old machines by a new one and the estimated time (Hour) for operation by each operator on the new machine is also indicated.

Machines							
Operator	M_1	M_2	M_3	M_4	M_5	M_6	New

01	2	3	2	1	4	5	6
02	4	4	6	3	2	5	1
03	6	10	8	4	7	6	1
04	8	7	6	5	3	9	4
05	7	3	4	5	4	3	12
06	5	5	6	7	8	1	6

Find out an allocation of operators to the old machines to achieve a minimum operation time.

(b) Reset the problem with the new machine and find out the allocation of the operators to each machine and comment on whether it is advantageous to replace an old machine to achieve a reduction in operating time only.

(c) How will the operators be reallocated to the machines after replacement?

5. An air-line operates seven days a week has time-table shown below. Crews must have a minimum layover (rest) time of 5 hrs, between flights. Obtain the pair of flights that minimizes layover time away from home. For any given pair the crews will be based at the city that result in the smaller layover.

Delhi-Jaipur			**Jaipur-Delhi**		
Flight No.	**Depart**	**Arrive**	**Flight No.**	**Depart**	**Arrive**
1	7.00 AM	8.00 AM	101	8.00 AM	9.15 AM
2	8.00 AM	9.00 AM	102	8.30 AM	9.45 AM
3	1.30 PM	2.30 PM	103	12.00 NOON	1.15 PM
4	6.30 AM	7.30 PM	104	5.30 PM	6.45 PM

for each pair, mention the town where the crews should be based.

[Hints – First of all construct a layover matrix showing times between flights when the crew is based in Delhi. For the sake of simplicity assume 15 minutes = 1 unit.

Flight	**101**	**102**	**103**	**104**
1	96	98	112	38
2	92	94	108	34
3	70	72	86	108
4	50	52	66	88

Since, the crew must have a minimum layover of 5 hrs between flights The layover time between flights 1 and 101 will be 24 hrs (96 units) from 8.00 AM to 8.00 AM next day i.e. flight 1 arrives Jaipur at 8.00 am and leaves Jaipur 8.00 am next day because the

minimum layover is 5 hrs between flights and other flights are there in between. So flight will be there next day only.

Flight 1 to 102 will be (98 units) 8.00 am arrives at Jaipur and leaves Jaipur at 8.30 am next day = 24 hrs + 30 minutes Flight 1 to 103 will be (112 units) 8.00 am arrives at Jaipur and leaves Jaipur at 12.00 noon next day = 24 hrs + 4 hrs = 112 units Flight 1 to 104 will be (38 units) 8.00 am arrives at Jaipur and leaves Jaipur at 5.30 pm on the same day = 9 hrs + 30 min = 38 mins Similarly timings for other flights are also computed. Next the layover matrix is formed for the situation when the crew is based at Jaipur and shown below.

Flight	**101**	**102**	**103**	**104**
1	87	85	71	49
2	91	89	75	53
3	113	111	97	75
4	37	35	21	95

Now a table for minimum layover times between the flights is constructed using the data of the above two tables. It is shown below. [Data marked with (*) denote the crew is based at Jaipur.

Flight	**101**	**102**	**103**	**104**
1	87*	85*	71*	38
2	91*	89*	75	34
3	70	72	86	75
4	37*	35*	21*	88

Using Hungarian Method the problem is solved now and the optimal assignment is given below. Flight 1 – 103, Flight 2 – 104, Flight 3 – 101 and Flight 4 – 102]

Answer:

1. Assignments are – 1 to A, 2 to Dummy, 3 to B and 4 to C Optimum assignment = 30 units
   Alternative solution – 1 to C, 2 to Dummy, 3 to B and 4 to A
2. Assignments are – 1 to B, 2 to D, 3 to A and 4 to C Minimum total time required = 18 hours
   Alternative solution – 1 to C, 2 to D, 3 to A and 4 to B

3. Assignments are – Salesman P to Zone A, Salesman Q to Zone B, Salesman R to Zone C & Salesman S to Zone D Maximum Sales = ` 297000

4. (a)

Operation	Machine	Time (hours)
01	M_3	2
02	M_1	4
03	M_4	4
04	M_5	3
05	M_2	3
06	M_6	1
Minimum Total Operation Time		17

(b)

Operation	Machine	Time (hours)
01	M_1	2
02	M_4	3
03	New	1
04	M_5	3
05	M_2	3
06	M_6	1
Minimum Total Operation Time		13

In place of M_3 New machine should be installed.

GAME THEORY

Question 292 : -

Two person zero sum game means that

(a) The sum of losses of one player is equal to the sum of the gains of the other

(b) The sum of losses of one player may not be equal to the sum of the gains of the other

(c) No player gains or loses

(d) None of the above

Question 293 : -

Game theory models are classified by the

(a) Number of players

(b) Sum of all payoffs

(c) Number of strategies

(d) All of these

Question 294 : -

A game is said to be unfair if

(a) Upper and lower values of the game are not equal

(b) Upper and lower values of the game are equal and the sum is zero

(c) Option (a) is correct but not Option (b)

(d) Option (b) is correct but not Option (a)

Question 295 : -

What happens when the maximin and minimax values of the game are equal?

(a) No solution exists

(b) Solution is mixed

(c) Saddle point exists

(d) None of these

Question 296 : -

A mixed strategy game can be solved by

(a) Arithmetic method

(b) Graphical method

(c) Dominance method

(d) All of these

Question 297 : -

The size of the payoff matrix of a game can be reduced by using the principle of

(a) Game inversion

(b) Rotation reduction

(c) Dominance

(d) Game transpose

Question 298 : -

The payoff value for which each player in a game always selects the same strategy is called the

(a) Saddle point
(b) Equilibrium point
(c) Both option (a) and option (b)
(d) None of the above

Question 299 : -

Games which involve more than two players are called

(a) Conflicting games
(b) Negotiable games
(c) N person game
(d) All of these

Question 300 : -

When the sum of the gains of one player is equal to the sum of the losses to another player then it is called

(a) Fair game
(b) Zero sum game
(c) Both option (a) and option (b)
(d) Only option (b) and not option (a)

Question 301 : -

When no saddle point is found in the payoff matrix of a game, the value of the game is found by

(a) Reducing the size of the game to apply the odds method
(b) Solving any one of the (2×2) sub game
(c) Finding the average of the values of the payoff matrix
(d) None of these

Question 302 : -

A saddle point exists when

(a) Maximin value = Maximax value
(b) Minimax value = Minimum value
(c) Minimax value = Maximin value
(d) Minimax value = Minimin value

Question 303 : -

In a pure strategy game

(a) Any strategy can be selected arbitrarily

(b) A particular strategy is selected by each player

(c) Both players select their optimal strategy

(d) None of these

Question 304 : -

In a mixed strategy game

(a) No saddle point exists

(b) Each player selects the same strategy without considering the choice of the other

(c) Each player always selects the same strategy

(d) None of these

Question 305 : -

Game theory is the study of

(a) Selecting optimal strategies

(b) Resolving conflict between players

(c) Giving equal outcome to the participants

(d) None of the above

Question 306 : -

If the value of the game is zero, then the game is known as

(a) Fair strategy

(b) Pure strategy

(c) Pure game

(d) Mixed strategy

Question 307 : -

The games with saddle points are

(a) Probabilistic in nature

(b) Normative in nature

(c) Stochastic in nature

(d) Deterministic in nature

Question 308 : -

When the game is played on a predetermined course of action, which does not change throughout the game then it is known as

(a) Pure strategy game
(b) Fair strategy game
(c) Mixed strategy game
(d) Unsteady game

Question 309 : -

If the losses of Player A are the gains of Player B, then it is called

(a) Lump sum game
(b) Zero sum game
(c) Unfair game
(d) None of the above

Question 310 : -

Identify the incorrect one

(a) A game without saddle point is probabilistic
(b) Game with saddle point will have pure strategies
(c) Game with saddle point cannot be solved with dominance rule
(d) Game without saddle point has mixed strategies

Question 311 : -

In case there is no saddle point in a game then the game is

(a) Deterministic game
(b) Fair game
(c) Mixed strategy game
(d) Multi player game

Question 312 : -

When Minimax and Maximin criteria matches then

(a) A fair game exists
(b) An unfair game exists
(c) Mixed strategy exists
(d) Saddle point exists

Question 313 : -

When there is dominance in a game then

(a) Least of the row ≥ Highest of another row

(b) Least of the row ≤ Highest of another row

(c) Every element in a row ≥ Corresponding element of another column

(d) Every element in a row ≤ Corresponding element of another row

Question 314 : -

A game is played when

(a) The manager gives signal

(b) Each player chooses one of his courses of action simultaneously

(c) The player who comes to the field first says he will start the game

(d) When the latecomer starts the game

Question 315 : -

In a game the list of the courses of action with each player is

(a) Finite

(b) Infinite

(c) Only 3

(d) None of the above

Question 316 : -

When the game is having a saddle point then the method used to solve the game is

(a) Linear Programming method

(b) Minimax and Maximin criteria

(c) Odds method

(d) Graphical method

Question 317 : -

Linear Programming method should be used to determine the value of the game when the size of the payoff matrix is

(a) 2×2

(b) 3×4

(c) m×2

(d) 2×n

Question 318 : -

If there are more than two persons in a game then the game is known as

(a) Non zero sum game

(b) Open game

(c) Multiplayer game

(d) Big game

Question 319 : -

A competitive situation is known as

(a) Competition

(b) Marketing

(c) Game

(d) All the above

Question 320 : -

Which one of the following is an assumption of Game Theory?

(a) All players act rationally and intelligently

(b) The winner alone acts rationally

(c) The loser acts intelligently

(d) Both believes in luck

Question 321 : -

For the Payoff Matrix $\begin{pmatrix} -5 & -2 \\ 10 & 5 \end{pmatrix}$ the maximising player always uses

(a) The first strategy

(b) Average of the two strategies

(c) The second strategy

(d) All the above strategies

Answers:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
a	d	a	c	d	c	a	c	d	a	c	c	a	a	c
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
d	a	b	c	c	d	d	b	a	b	b	c	c	a	c

B. NUMERICAL QUESTIONS

⊙ **Comprehensive Numerical Problems**

1. Find the optimal strategies of the Players for the game having payoff matrix. What is the value of the Game?

Strategies	B_1	B_2	B_3	B_4
A_1	1	7	3	4
A_2	5	6	4	5
A_3	7	2	0	3

2. Solve the game $\begin{pmatrix} 5 & 1 \\ 3 & 4 \end{pmatrix}$

3. Reduce the following game by Dominance Rules and Solve it.

		Strategies of Minimising Player				
		P	Q	R	S	T
Strategies of Maximising Player	I	1	3	2	7	4
	II	3	4	1	5	6
	III	6	5	7	6	5
	IV	2	0	6	3	1

4. Solve the game $\begin{pmatrix} 3 & -4 \\ 2 & 5 \\ -2 & 8 \end{pmatrix}$ using Graphical method

5. In the suburban area of a large city there are two stores Laxmi Bhandar and Goswami Stores who handle sundry goods. The total number of customers is equally divided between the two due to the fact that the price, quality of goods, services etc. of the two are at par. Assume that a gain of customers for Laxmi Bhander is a loss to Goswami Stores and vice versa. Both the stores plan to run annual sales during the festival period of the year. Sales are advertised through Social Media, Cable TV local channel and Printed Leaflets. Based on the past experience, Laxmi Bhander has prepared the following payoff matrix for the gain or loss in percentage of customers for its different strategies against various counter strategies of Goswami Stores.

	Strategies of Goswami Stores		
Strategies of Laxmi Bhander	**Printed leaflets**	**Cable TV**	**Social media**
Printed leaflets	30	40	- 80
Cable TV	0	15	- 20
Social media	90	20	50

Determine the optimal strategies and worth of such strategies for the stores. What is

meant by the cell entry – 80 in the above payoff matrix?

6. Two competing firms (A and B) produce consumer goods of different kind. Among the products one is considered as their bread and butter in terms of the revenue generated. Both the firms are very cautious about the market share for this particular product and keep on doing advertisement campaigns throughout the year to retain the existing customers and also to attract the new ones. For this the marketing teams of both work round the clock and that of A developed data corresponding to varying degrees of advertisement. Same is given below:

   (a) If both the firms take same strategy to counter each other then their market share will be equal.

   (b) Against firm A's strategy of "No marketing" if B goes for "Medium marketing" then A's share of the market will be 40%. For the same strategy of A the market share will be 28% if B takes the strategy "Large marketing"

   (c) Against firm A's strategy of "Medium marketing" if B goes for "No marketing" then A's share of the market will be 70%. For the same strategy of A the market share will be 45% if B takes the strategy "Large marketing"

   (d) Against firm A's strategy of "Large marketing" if B goes for "No marketing" then A's share of the market will be 75%. For the same strategy of A the market share will be 47.5% if B takes the strategy "Medium marketing"

   Based on the above information prepare the Payoff Matrix. Solve the game problem to get the optimal strategies of the player A. What is the value of the game?

7. Using the data of the above problem prepare the Payoff Matrix for A when you are supplied with the following information.

   (a) Selling price of the product = ` 4 per unit

   (b) Variable cost of the product = ` 2.50 per unit

   (c) Annual cost for Medium advertising = ` 5000

   (d) Annual cost for Large advertising = ` 15000

   (e) Annual sales volume of the product for Firm A = 30000 units
   What advertising policy should firm A pursue?

   Hints-

   Find out the Annual sales volume, for different combination of strategies of A and B. As an example, Annual Sales volume corresponding to A's strategy of "Medium advertisement" and B's strategy of "Large advertisement" is 45% of 30000 = 13500 units

   Calculate Annual Profit to the Firm A using the formula below for various combination of strategies of A and B.

   Annual Profit = (Selling price – Variable cost) × Annual Sales volume – Annual cost of

advertising Example of this calculation is:-

For A's strategy of "Medium advertisement" and B's strategy of "Large advertisement" the Annual Profit of Firm A is (4 – 2.5) × 13500 – 5000 = ` 15250/-

When the Profit figures for all the combinations of strategies of A and B are calculated then the following payoff matrix is obtained.

	Strategies of B		
Strategies of A	**No advertising**	**Medium advertising**	**Large advertising**
No advertising	22500	18000	12600
Medium advertising	26500	17500	15250
Large advertising	18750	6375	7500

From the above matrix we find, against the various strategies of A, the minimum profit figures are as follows –

For No advertising – ` 12600

For Medium advertising – ` 15250

For Large advertising – ` 6375

Thus, to maximise the minimum profit, A should opt for Medium advertising and spend ` 5000 per annum

Answers:

1. Optimal strategies A_2 and B_3. Value of the game = 4
2. Strategies of the Maximising Player = (1/5, 4/5) & for the Minimising Player = (3/5, 2/5). Value of the game = 17/5
3. Optimal strategy for the Maximising Player is III and that for the Minimising Player is Q. Value of the game = 5
4. Optimal strategy of the Maximising Player (0.3, 0.7, 0) and for the Minimising Player (0.9, 0.1). Value = 2.3
5. Optimal strategies of Laxmi Bhander = (1/5, 0, 4/5) and for Goswami Stores = (0, 13/15, 2/15), Value of the game = 24

   Cell entry (– 80) means when Laxmi Bhander will take the strategy of distributing Printed Leaflets against the counter strategy of Goswami Stores of Social Media advertisement then they will lose 80% of their customer which will be gained by Goswami Stores.
6. The payoff matrix Showing A's market share is –

	Strategies of B		
Strategies of A	**No advertising**	**Medium advertising**	**Large advertising**
No advertising	50	40	28
Medium advertising	70	50	45
Large advertising	75	47.5	50

Probabilities of A's strategies are (0, 1/3, 2/3). Value of the game = 145/3 = 48.3 Thus, A can expect to have 48.3% market share.

SIMULATION

Question 322 : -

Which of the following is first step for performing Simulation analysis?

(a) Choose input variables.

(b) Create entities for the simulation process.

(c) Prepare a problem statement.

(d) Determine the output variables.

Question 323 : -

Which of the following are the advantages of using Modelling and Simulation?

(a) Easy to understand.

(b) Easy to test.

(c) Easy to upgrade.

(d) All of the above.

Question 324 : -

Which one of the following is not an application area of Modelling and Simulation?

(a) Military applications

(b) Designing semiconductors

(c) Telecommunications

(d) Food industry

Question 325 : -

Which of the following is the first step for developing the Simulation Model?

(a) Design the problem

(b) Identify the problem.

(c) Collect and start processing the system data

(d) Develop the model using Network diagram.

Question 326 : -

Simulation is the process of using a model to study the performance of a system.

(a) Agreeable

(b) Not agreeable.

(c) Partly agreeable

(d) Cannot comment.

Question 327 : -

Disadvantage of using Modelling and Simulation lies in the statement –

(a) Simulation requires manpower and it is a time consuming process.

(b) Simulation results are difficult to translate and only experts can understand it.

(c) Simulation is an expensive process.

(d) All of the above.

Question 328 : -

Monte Carlo Simulation gets its name from which of the following?

(a) Data collection.

(b) Model formulation

(c) Random number assignment

(d) Analysis

Question 329 : -

Select the valid reasons for using Simulation.

(a) Relationship between the variables is non-linear.

(b) Optimized solutions are obtained.

(c) Conduct experiment without disrupting the real system.

(d) Both (a) and (c)

Question 330 : -

Simulation uses logical relationship and mathematical expressions of the –

(a) Real system

(b) Computer model

(c) Performance measures

(d) Inferences

Question 331 : -

While assigning random numbers in Monte Carlo Simulation, it is –

(a) Not necessary to assign the exact range of random number interval as the probability.

(b) Necessary to develop a cumulative probability distribution.

(c) Necessary to assign the particular appropriate random numbers.

(d) All of the above.

Question 332 : -

Random numbers are used –

(a) To give random outcomes.

(b) To describe the uncertainty of the input values.

(c) To assign values to the parameters.

(d) To change the problem solution.

Question 333 : -

Simulation can keep track of several different kinds of information, including orders, inventory, financial planning

(a) Correct

(b) Partly correct

(c) Totally incorrect

(d) None of the above

Question 334 : -

Monte Carlo Simulation ensures that –

(a) The simulated probability distribution will be the same as the actual probability distribution.

(b) Only one uncertain decision can be taken in any simulation model.

(c) Probabilities will have at most two decimal place values.

(d) Each one of the above statement is true.

Question 335 : -

What should a Project Manager do when his preliminary task estimate differs from Monte Carlo Simulation?

(a) Perform more Monte Carlo Simulation runs.

(b) Use this information to assess project uncertainty and risk and to review and possibly change crucial variables.

(c) Scrap the project as untenable.

(d) Discuss these differences at future project team meetings.

Question 336 : -

What can be expected at the end of a Monte Carlo Simulation exercise?

(a) A conservative outcome.

(b) A decision backed by number that makes the decision maker confident about moving forward.

(c) All outcomes from all possible probabilities exercise.

(d) None of the above.

Question 337 : -

Analytical results are taken into consideration before a simulation study so as to -

(a) Identify suitable values of the system parameter
(b) Determine the optimal decision.
(c) Identify the suitable values of the decision variables for the specific choice of the system.
(d) All of the above.

Question 338 : -

Which of the following statements are applicable for Pseudo Random Numbers?
(a) They are numbers similar to Random Numbers.
(b) They are generated by using Remainder Method.
(c) They satisfy the statistical test for randomness.
(d) All of the above.

Question 339 : -

Large complicated simulation models are appreciated because –
(a) Their average costs are not well defined
(b) It is difficult to create the appropriate events
(c) Both (a) and (b) are true.
(d) None of the above is true.

Question 340 : -

Simulation should not be applied in all cases because it –
(a) Requires considerable talent for model building and extensive computer programming efforts.
(b) Consumes too much computer time.
(c) Provides at best an approximate solution to the problem.
(d) All of the above.

Question 341 : -

Simulation is defined as –
(a) A technique that uses computers.
(b) An approach for reproducing the processes by which events by chance and changes are created by computers.
(c) A procedure for testing and experimenting on models to answer what if, then so and so type questions.
(d) All of the above.

Question 342 : -

Few causes of simulation analysis failure are –

(a) Inadequate level of user participation.
(b) Inappropriate levels of detail.
(c) Incomplete mix of essential skills.
(d) All of the above.

Question 343 : -

To make simulation more popular –
(a) Large cost overruns need to be avoided.
(b) Prolonged delays need to be avoided.
(c) User dissatisfaction with simulation results need to be avoided.
(d) All of the above.

Question 345 : -

The important step required for simulation approach in solving a problem is –
(a) Test and validate the model.
(b) Design the experiment.
(c) Conduct the experiment.
(d) All of the above.

Question 346 : -

The general purpose system simulation language –
(a) Requires program writing
(b) Does not require program writing.
(c) Requires predefined coding forms.
(d) Needs a set of equations to describe a system.

Question 347 : -

An advantage of simulation as opposed to optimization is that –
(a) Several options of measure of performance can be examined.
(b) Complex real life problems can be studied.
(c) It is applicable to cases where there is randomness in a system
(d) All of the above.

Question 348 : -

The purpose of using simulation technique is to –

(a) Imitate a real world situation.

(b) Understand properties and operating characteristics of complex real life problems.

(c) Both (a) and (b) above.

(d) Only (b) but not (a).

Question 349 : -

As simulation is not an analytical model, its solution should be viewed as –

(a) Exact

(b) Unrealistic

(c) Approximation.

(d) Simplified

Question 350 : -

All of the following are advantages of simulation except –

(a) Facilitates in finding the optimal solution.

(b) It is a low cost process.

(c) It deals with playing Games.

(d) Time compression is an issue with it.

Question 351 : -

The drive up window of a fast food operation was being studied using simulation for a variety of operating characteristics. As part of the study data was collected on Order Processing Time as given in the following table. Using the first two digits of the Random Numbers, determine the processing time that would be used to simulate the fifth sample.

Processing time (Minutes)	1	2	3	4
Relative Frequency	0.30	0.45	0.20	0.05

Customer	1	2	3	4	5	6	7	8	9	10
Random No.	1048	2236	2413	4216	3757	1501	4657	4836	9309	3997

(a) 2 minutes

(b) 4 minutes

(c) 1 minute

(d) 3 minutes

Question 352 : -

The drive up window of a fast food centre was being studied using simulation for a variety of operating characteristics. As part of the study data was collected on Customer Arrivals as given in the following table. Using expected value calculations determine the expected time between customer arrivals.

Inter arrival time (Minutes)	0.5	1.0	2.0	3.0	4.0	5.0	6.0
Probability	0.10	0.25	0.20	0.30	0.05	0.05	0.05

(a) 2.35 minutes

(b) 2.00 minutes

(c) 2.70 minutes

(d) 1.65 minutes

Answers:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
c	d	d	b	a	d	c	d	a	b	b	a	a	b	b
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
c	d	b	d	d	d	d	d	b	d	c	c	b	a	a

B. NUMERICAL Questions

⊙ Comprehensive Numerical Problems

1. An automobile production line turns out about 100 cars a day, but deviations occur owing to many causes. The production is more accurately described by the probability distribution given below

Production/Day	**Prob.**	**Production/Day**	**Prob.**
95	0.03	101	0.15
96	0.05	102	0.10
97	0.07	103	0.07
98	0.10	104	0.05
99	0.15	105	0.03
100	0.20		
		Total	1.00

Finished cars are transported across the bay, at the end of each day, by ferry. If the ferry has space for only 101 cars, what will be the average number of cars waiting to be shipped, and what will be the average number of empty space on the boat? Random numbers are given below:

20, 63, 46, 16, 45, 41, 44, 66, 87, 26, 78, 40, 29, 92, 21

2. After observing heavy congestion of customers over a period of time in a petrol station, Mr. Petro has decided to set up a petrol pump facility on his own in a nearby site. He has compiled statistics relating to the potential customer arrival pattern an service pattern as given below. He has also decided to evaluate the operations by using the simulation technique

Arrivals		**Services**	
Inter-arrival time (minutes)	**Probability**	**Inter-arrival time (minutes)**	**Probability**
2	0.22	4	0.28
4	0.30	6	0.40
6	0.24	8	0.22
8	0.14	10	0.10
10	0.10		

Assume:

(i) The clock starts at 8:00 hours

(ii) Only one pump is set up.

(iii) The following12 Random Numbers are to be used to depict the customer arrival pattern: 78, 26, 94, 08,

46, 63, 18, 35, 59, 12, 97 and 82.

(iv) The following 12 Random Numbers are to be used to depict the service pattern: 44, 21, 73, 96, 63, 35,

57, 31, 84, 24, 05, 37

You are required to find out the

(i) probability of the pump being idle, and

(ii) Average time spent by a customer waiting in queue.

3. The Tit-Fit Scientific Laboratories is engaged in producing different types of high class equipment for use in science laboratories. The company has two different

assembly lines to produce its most popular product 'Pressure'. The processing time for each of the assembly lines is regarded as a random variable and is described by the following distributions.

Process Time (minutes)	Assembly A1	Assembly A2
10	0.10	0.20
11	0.15	0.40
12	0.40	0.20
13	0.25	0.15
14	0.10	0.05

Using the following random numbers, generate data on the process times for 15 units of the item and compute the expected process time for the product. For the purpose, read the numbers vertically taking the first two digits for the processing time on assembly A1 and the last two digits for processing time on assembly A2.

4134	8343	3602	7505	7428
7476	1183	9445	0089	3424
4943	1915	5415	0880	9309

4. A book store wishes to carry 'Ramayana' in stock. Demand is probabilistic and replenishment of stock takes 2 days (i.e. if an order is placed on March 1, it will be delivered at the end of the day on March 3). The probabilities of demand are given:

Demand (daily)	0	1	2	3	4
Probability	0.05	0.10	0.30	0.45	0.10

Each time an order is placed, the store incurs an ordering cost of ` 10 per order. The store also incurs a carrying cost of ` 0.50 per book per day. The inventory carrying cost in calculated on the basis of stock at the end of each day.

The manager of the bookstore wishes to compare two options for his inventory decision.

A. Order 5 books when the inventory at the beginning of the day plus order outstanding is less than 8 books.

B. Order 8 books when the inventory at the beginning of the day plus order outstanding is less than 8. Currently (beginning 1st day) the store has a stock of 8 books plus 6 books ordered two days ago and
expected to arrive next day.
Using Monte-Carlo Simulation for 10 cycles, recommend, which option the manager, should choose. The two digit random numbers are given below:

89	34	70	63	61	81	39	16	13	73

Answers:

1.	Average number of cars waiting to be shipped = 0.4, Average number of empty spaces = 1.2
2.	Probability of idle time of the petrol station = 0.14, Average time spent by a customer = 11.67 mins.
3.	Expected process time for the product = 23.27 minutes.
4.	Option B is better because it has lower inventory cost.

NETWORK ANALYSIS

Question 353 : -

Critical Activities have

(a) Maximum float

(b) Minimum float

(c) Zero float

(d) Negative float

Question 354 : -

In PERT Chart, the Activity time distribution is -

(a) Normal

(b) Binomial

(c) Poisson

(d) Beta

Question 355 : -

A PERT Network has nine activities on its Critical Path. The Standard Deviation of each activity on the Critical Path is 3. The S. D of the Critical Path is –

(a) 3

(b) 9

(c) 81

(d) 27

Question 356 : -

For an activity the pessimistic, most likely and optimistic times are respectively 10, 6 and 2 days. The expected duration of the activity is –

(a) 6 days

(b) 3 days

(c) 2 days

(d) 9 days

Question 357 : -

The time by which the activity completion time can be delayed without affecting the start of the succeeding activities is known as –

(a) Total float

(b) Free float

(c) Independent float

(d) Head slack

Question 358 : -

Which of the following statement is not true?

(a) PERT is deterministic in nature.

(b) CPM is probabilistic in nature.

(c) PERT Network can be crashed.

(d) All of the above.

Question 359 : -

Following data refers to a project Network. What will be the Critical Path?

Activity	1 – 2	2 – 3	3 – 4	1 – 4	2 – 5	3 – 5	4 – 5
Duration	2 Days	1 Day	3 Days	3 Days	3 Days	2 Days	4 Days

(a) 1 – 2 – 3 - 5

(b) 1 – 2 – 3 – 4 – 5

(c) 1 – 4 – 5

(d) 1 – 4 – 3 – 5

Question 360 : -

The amount of time by which an activity can be delayed without affecting the project completion is called –

(a) Free float

(b) Total float

(c) Interfering float

(d) None of the above

Question 361 : -

Optimistic time and pessimistic time of an activity are respectively 4 days and 16 days. Variance of the duration of the activity will be –

(a) 4 day2

(b) 2 day2

(c) 3 day2

(d) None of the above

Question 362 : -

In a project planning Free float can affect which of the following?

(a) Succeeding activity

(b) Only that activity

(c) Preceding activity

(d) All of the above

Question 363 : -

Solution of problems of Crashing has to be started by applying the technique on –

(a) Any activity of the Network.

(b) Non critical activities.

(c) Critical activities.

(d) None of the above.

Question 364 : -

A PERT activity has an optimistic time of 3 days, pessimistic time of 15 days and an expected time of 7 days. What is the most likely time of the activity?

(a) 10 days

(b) 6 days

(c) 5 days

(d) None of the above

Question 365 : -

The reduction in project time normally results in –

(a) Decrease in Direct Cost and increase in Indirect Cost

(b) Increase in Direct Cost and decrease in Indirect Cost

(c) Increase in both Direct and Indirect Costs.

(d) Decrease in both Direct and Indirect Costs.

Question 366 : -

The Normal duration and Normal cost of an activity are respectively 10 days and ` 350. The cost slope is ` 75 per day. If the Crash duration is 8 days then what is the Crash cost of the activity?

(a) ` 400/-

(b) ` 500/-

(c) ` 600/-

(d) ` 650/-

Question 367 : -

Which of the following is incorrect?

(a) PERT is suitable for projects having probabilistic time estimates.

(b) CPM is suitable for projects having deterministic activities.

(c) Both PERT and CPM are event oriented.

(d) PERT is event oriented while CPM is activity oriented.

Question 368 : -

The activity that must be completed prior to the start of an activity is called –

(a) Dummy activity

(b) Successor activity

(c) Concurrent activity

(d) Predecessor activity

Question 369 : -

The slack times of Tail and Head events of Activity P are respectively 10 days and 4 days. If the Free float of the Activity P is 12 days then the Total float would be –

(a) 8 days

(b) 16 days

(c) 22 days

(d) None of the above

Question 370 : -

Which of the following represents reduction in project duration?

(a) Crashing

(b) Negative slack

(c) Variance

(d) All of the above

Question 371 : -

Critical Path Method is good for –

(a) Small projects only

(b) Large projects only

(c) Both small and large projects equally

(d) Neither small nor large projects

Question 372 : -

The optimum duration is the –

(a) Summation of normal durations of each activity of the project.

(b) Summation of normal durations of activities in the Critical Path.

(c) One which gives the minimum Total Cost for the completion of the project.

(d) Summation of crash durations of activities in the Critical Path.

Question 373 : -

Which of the following is not a notable challenge while scheduling a project?

(a) Deadlines exist

(b) Independent activities

(c) Too many workers may be required

(d) Costly delay

Question 374 : -

A critical path is –

(a) The shortest path

(b) The longest path

(c) The path that begins from the start node and ends at the last node.

(d) All of the above.

Question 375 : -

Activities A, D and F merges at the event 6. If the earliest finish times of A, D and F are respectively 13, 17 and 8 then the earliest time of Event 6 is –

(a) 8

(b) 13

(c) 17

(d) Cannot be determined from the given information.

Question 376 : -

Which of the following is true when a project is scheduled by Critical Path Analysis?

(a) Work breakdown structure is used to divide the project into different activities.

(b) Duration for each activity is established.

(c) Precedence relationship of the activities is determined.

(d) All of the above.

Question 377 : -

Total Project Cost versus Duration curve is –

(a) Parabolic

(b) S shaped

(c) U shaped

(d) Linear

Question 378 : -

Activities P, Q and R are the immediate successors of the activity N. If their current starting times are 10, 11 and 17 respectively then what is the latest finishing time of the activity N?

(a) 10

(b) 11

(c) 17

(d) None of the above

Question 379 : -

Activity in a Network diagram is represented by –

(a) Circle

(b) Rectangle

(c) Square

(d) Arrow

Question 380 : -

The particular task performance in CPM is known as –

(a) Event

(b) Activity

(c) Dummy

(d) Contract

Question 381 : -

Among the following, critical path and slack time analysis mostly help

(a) Managers define the project activities

(b) Highlight relationships among project activities.

(c) Point out who is responsible for various activities

(d) Pinpoint activities that need to be closely watched.

Answers:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
c	d	b	a	b	d	d	b	a	c	c	b	b	b	c

16	17	18	19	20	21	22	23	24	25	26	27	28	29	
d	b	a	b	c	b	b	c	d	c	a	d	b	d	

B. NUMERICAL QUESTIONS

⊙ Comprehensive Numerical Problems

1. Information about a project are given as follows

Activity	A	B	C	D	E	F	G	H	I	J	K
Predecessor Activity	None	None	A	None	B, C	D	D	E, F	E, F	G, I	H
Least time	4	5	8	2	4	6	8	5	3	5	6
Greatest time	8	10	12	7	10	15	16	9	7	11	13
Most likely time	5	7	11	3	7	9	12	6	5	8	9

Draw the Network diagram and identify the Critical Path. Find the Earliest and Latest times of each Event. Also calculate the Total Float for each activity. Consider the unit of various times given above is weeks.

2. [**Case Study**] M/S Ramswarup Limited is a renowned trader of Steel Structural with head office in Kolkata, has planned to diversify and decided to enter into manufacturing sector. They want to put up a Foundry with an aim to produce high quality abrasion resistant castings which has a very good export potential. A detailed study has been carried out by the team of M/S Ramswarup with the help of consultant Dr. P.K.Mathur who is a management consultant with vast hands on experience in manufacturing of castings. After the study, Dr. Mathur suggested not to go for a huge installed capacity at the beginning. Rather he is of the opinion to go in phases. Accordingly he listed the following necessary activities with associated precedence relationships as well as Expected Durations and S.Ds in weeks for the first phase operation.

Activity	A	B	C	D	E	F	G	H	I	J
Prede-cessor	None	None	A	A	A	C	D	B, D, E	H	I, G, F
Dura-tion	6	3	5	4	3	3	5	5	2	3

S.D	1	0.5	1	1	0.5	0.5	1	1	0.5	1

You are entrusted with the responsibility of assisting Dr. Mathur in different areas as he deemed necessary. To properly Plan, Schedule and Control the first phase of the project, Dr. Mathur wants you to draw the Network diagram and identify the Critical Path. Also he wants to know the project duration.

After getting the Network diagram from you, Dr. Mathur submitted the same to the top management of the company for getting a green signal to start the work. Till the permission is obtained, Dr. Mathur envisaged some delay in the Activities B, E and G by 3, 2 and 2 weeks respectively. He wants to know from you the effect of these delays on the project completion. It has to be reported to him urgently so that he can subsequently bring the same to the notice of the management.

The durations mentioned in the above table are expected values which are Normally distributed with the Standard Deviations (S.D) mentioned above. Ignoring the delays mentioned above for the activities B, E and G and possible effect of uncertainty in the non - critical activities, determine 95% Confidence Interval for the Expected Project Completion.

The Cost of the project is estimated to be ` 10,00,000/-. If it is completed within 24 weeks the expected returns should be `10,000,000/-. But if the deadline fails the export market will be penetrated by competitors from South Africa and Australia. That will result in a net revenue of only ` 2,00,000/-. You need to determine the expected returns ignoring the delays mentioned before and report it to Dr. Mathur.

[**Hints** – Critical Path is A – D - Dummy – H – I – J and project duration is 20 weeks (Can be obtained by drawing the Network diagram)

On calculation of Total Float, the values of the same for Activities B, E and G are respectively 7, 1 and 2 weeks. So delay of 3 weeks in B and 2 weeks in G are not going to hamper the project completion. But delay of 2 weeks in E is going to increase the project duration by 1 week because it is having a Total Float of 1 week.

Mean project duration = 20 weeks (from Network diagram)

Variance of project duration = Sum of the variances of the Critical Activities i.e A, D, H, I & J = $1^2 + 1^2 + 1^2 + (0.5)^2 + 1^2$

S.D of project duration = $\sqrt{[1^2 + 1^2 + 1^2 + (0.5)^2 + 1^2]}$ = 2.06 weeks

So 95% Confidence Interval of the expected project completion = Mean duration ± 1.96 (S.D) = 20 ± 1.96 × 2.06 = 15.96 to 24.04 weeks

P (Project duration exceeds 24 weeks) = P (X > 24) = P [Z > (24 – 20)/ 2.06] = P [Z > 1.94) = 1 – P (Z ≤ 1.94)

= 1 – 0.9738 = 0.0262

Expected return from the project = 10,000,000 × P (Project will be completed within 24 weeks) + 2,00,000 × P (Project will not be completed within 24 weeks) – Initial investment = 10, 000, 000 × (1 – 0.0262) + 2,00,000 × 0.0262 – 10, 00, 000 = ` 87, 43, 240/-]

3. The following table gives the activities and other relevant data for a project

Activity	1 – 2	1 – 3	1 – 4	2 – 3	2 – 5	3 – 5	4 - 5
Normal Time (Days)	4	2	5	7	7	2	5
Crash Time (Days)	3	2	4	5	6	1	4
Normal Cost (`)	600	400	750	400	800	500	600
Crash Cost (`)	800	400	900	600	1000	650	850

Indirect cost for the project is ` 200 per day.

Draw the Network diagram. Find Normal duration and cost of the project. Also find optimum duration and cost for it.

4. Activity P is followed by Activity Q which in turn, is followed by Activity R. The Direct Cost of these Activities in relation to the choice of feasible durations is given in the Table below. For all the three activities taken together what is the minimum possible Direct Cost for a total duration of 21 days.

	Activity P			Activity Q			Activity R		
Duration (Days)	7	6	5	8	7	6	9	8	7
Direct Cost (` '000)	12	14	15	20	23	27	40	42	45

5. A project has four activities P, Q, R and S as shown below.

Activity	Normal Duration (Days)	Predecessor Activity	Cost Slope (` / DAY)
P	3	-	500
Q	7	P	100
R	4	P	400
S	5	R	200

Normal Cost of the project is ` 10000/- and the Overhead Cost is ` 200 per day. If the project duration has to be crashed down to 9 days, then what will be the Total Cost of the project?

Answers:

1. Critical Path: A – C – E – H – K,

   Values of Total Floats (in weeks) for the Activities A through K are respectively 0, 8.83, 0, 10, 0, 10, 15, 0, 2.5, 2.5, 0

2. Refer to the Hints given with the question.

3. Normal project duration = 13 days and cost = ` 6650/-, Optimum project duration = 10 days and cost = ` 6450
4. ` 77000
5. ` 12500

LEARNING CURVE

Question 382 : -

A Learning Curve describes

(a) The increase in number of units produced per unit time as the total number of units

produced increases

(b) The rate at which an organisation acquires new information.

(c) The amount of production time per unit as the total number of units produced increases.

(d) The increase in production time as the total number of units produced increases.

Question 383 : -

Limitations of the Learning Curve approach include –

(a) Learning Curves must be redeveloped whenever the product or the production process is modified.

(b) Learning Curves are applicable when considering a highly automated process.

(c) Learning Curves are only valid when considering simple production process.

(d) Learning Curves are only valid when the total number of units produced is relatively small.

Question 384 : -

Which of the following statements about Learning Curve is incorrect?

(a) A change in the process disrupts the Learning Curve.

(b) The rate of learning varies depending on the quality of management.

(c) The Learning Curve can be disrupted by the change in personnel.

(d) Learning Curves show that the time saved in completing each subsequent unit increases.

Question 385 : -

Which of the following is not an application of Learning Curve?

(a) Learning Curves allow a manager to predict the time required for new employee orientation on company policies and procedures.

(b) Learning Curves permit a manager to prepare a work schedule.

(c) Learning Curves allow a manager to forecast the labour requirements while preparing a departmental employee budget.

(d) Learning Curves can be employed in supply chain negotiations.

Question 386 : -

The Learning Curve remains valid –

(a) When applied to different firms in the same industry.

(b) For product modification that will simplify the product assembly.

(c) As long as process revisions involve only the addition of automated machinery.

(d) As long as production volume increases and processes are consistent.

Question 387 : -

A 100% Learning Curve implies that –

(a) Organisational learning has taken place.

(b) The Learning Curve can be applied universally across an industry.

(c) No learning has been achieved.

(d) Direct labour time is reduced 100% for each doubling of production.

Question 388 : -

Which of the following statement is true?

(a) The Learning Curve displays the relationship between process time per unit and the cumulative number of units produced.

(b) Learning Curves are most easily developed for one off type orders.

(c) Learning Curves are based on the Normal distribution.

(d) The standard time for a process is determined from the Learning Curve when cumulative production is fifty units.

Question 389 : -

Learning Curve is also known as –

(a) Growth curve

(b) Production curve.

(c) Exponential curve

(d) Experience curve.

Question 390 : -

For organisations with wide variety of product range which of the following statement is correct?

(a) Different product will have different Learning Curves.

(b) Learning percentage for different product will be different.

(c) Both (a) and (b)

(d) None of the above

Answers:

1	2	3	4	5	6	7	8	9
c	b	d	d	d	c	a	d	c

B. Numerical Questions

MULTIPLE CHOICE QUESTIONS

1. After studying the activities of the employees of one department of a large retail outlet, the manager has come out with a Learning Curve by computing the value of b using the relation b = log r / log 3 instead of the traditional way. Which statement below is best suited to this?

   (a) If both the department under study and another department take 10 hours to complete a task for the first time then the time required for performing the task 30th time is lower for the department under study.

   (b) If both departments have a learning rate of 90% and take 10 hours for performing a task for the first time then the time required by the department under study for performing the task 27th time is the same as the time required by the other department performing the task 8th time, given that the other department uses the traditional way of calculating b.

   (c) This method is not valid since the denominator of the formula has log 3 instead of log 2.

   (d) The employees of the department under study learn faster than the other employees.

2. How long will it take to produce the 4th unit with 80% learning if the first unit took 75 hours?

   (a) 48 hours

   (b) 117 hours

   (c) 60 hours

   (d) None of the above

3. Bimal and Kamal are the two industrial workers engaged in doing a similar job. They have different learning rates of 80% and 90% respectively. Times taken to complete their first jobs are respectively 12 and 8 hours. If both continue with the same learning rate then after how many units Bimal will be faster than Kamal?

   (a) 5th unit

   (b) 7th unit

   (c) 11th unit

   (d) 19th unit

4. How long will it take to produce the fifth unit with 85% learning rate, if the third unit took 13 hours?

   (a) 10.3 hours

   (b) 10.0 hours

   (c) 11.4 hours

   (d) 11.5 hours

5. When 24 hours is required to produce a condenser of a particular type then the time required to produce the 16th unit with 85% Learning Curve is –

   (a) Between 9 and 10 hours

   (b) Between 12 and 14 hours

   (c) Between 15 and 17 hours

   (d) Between 18 and 20 hours

6. A diesel engine manufacturing company has an order of 4 large engines. A crew of 16 members took 4000 hours to assemble the first engine. If 80% Learning Curve is used then what will be the labour cost of the fourth engine, assuming average labour rate to be ` 180 per hour?

   (a) Between ` 4 to 4.5 Lakhs

   (b) Between ` 3.5 to 4 Lakhs

   (c) Between ` 3 to 3.5 Lakhs

   (d) Between ` 4.5 to 5 Lakhs

7. A builder requires 4000 hours to complete his first house. The experienced team of workers has a learning rate of 80%. How much time will be required to complete the 10th house?

   (a) Between 1900 and 2000 hours

   (b) Between 2000 and 2100 hours

   (c) Between 2100 and 2200 hours

   (d) Between 2200 and 2300 hours

8. Using the data of the above question what is the total time required to complete the first 4 houses?

   (a) Between 4000 and 7000 hours

   (b) Between 7000 and 9000 hours

   (c) Between 9000 and 11000 hours

   (d) Between 11000 and 13000 hours

9. For a 90% Learning Curve which one of the following statement is correct?

   (a) Production time of each unit is 90% of the production time of the preceding unit.

   (b) Direct labour time is reduced by 10% each time the production volume doubles.

   (c) The learning process causes a 90% saving in the material content of the product.

   (d) Only 10% defectives are produced during the process of learning.

10. To determine the Learning Curve for an assembly activity in a factory, time study is carried out with the help of a stop watch which shows a minute in place of an actual time

of 66 seconds. Which of the following statement suits best to describe this situation?

(a) The learning rate determined with this reading is 10% lower than the actual.

(b) The learning rate determined with this reading is 10% higher than the actual.

(c) A schedule to produce 50 units based on these calculations will have 10% excess time built into it.

(d) A schedule to produce 50 units based on these calculations will have 10% less time built into it.

11. A manufacturing unit has 95% Learning Curve. To bag a huge order of a special item, the company made a prototype of the same. It took 25 hours to complete. As per the standard norms laid by the management of the company, the learning period will be over when the per unit production time is reduced by 20%. To achieve this norm for this special item, the production has to run continuously for

(a) 736 hours

(b) 572 hours

(c) 428 hours

(d) 199 hours

Answer

1	2	3	4	5	6	7	8	9	10	11
b	a	c	d	b	d	a	d	b	c	c

MAXIMA MINIMA

Question 391 : -

Optimization is the method of finding

(a) The maximum point

(b) The minimum point

(c) The critical point

(d) All of the above

Question 392 : -

Choose the correct answer

(a) Optimization problems should have only one objective function

(b) Constraint functions are compulsory for any optimization problem.

(c) Objective function must be a continuous function

(d) None of the above

Question 393 : -

The process of finding relative maximum or minimum of a function is known as

(a) Optimization

(b) Maximization

(c) Minimization

(d) Any of these

Question 394 : -

For a Cost Function TC = $3Q^2 + 7Q + 12$, MC is –

(a) 6Q

(b) 6Q + 7

(c) 3Q + 12

(d) None of the above

Question 395 : -

MR is

(a) First order derivative of TC

(b) Second order derivative of TR

(c) First order derivative of TR

(d) Second order derivative of TC

Question 396 : -

In unconstrained optimization with single variable the sufficient condition for maximization is –

(a) Second order derivative of the objective function must be zero.
(b) Second order derivative of the objective function must be less than zero
(c) Second order derivative of the objective function must be less than zero.
(d) None of the above

Question 397 : -

In case of unconstrained optimization involving two variables the necessary condition is –
(a) First order derivative of the objective function with respect to the variables should be zero.
(b) First order partial derivative of the objective function with respect to the variables should be zero.
(c) Either one of (a) and (b)
(d) Both (a) and (b)

Question 398 : -

A Firm is said to achieve Condition of equilibrium when
(a) Its objective is optimized.
(b) Its profit is maximized.
(c) Its loss is minimized
(d) All of the above.

Question 399 : -

In the expression $D = AC - B^2$ used for describing the sufficient conditions for unconstrained optimization involving two variables (x and t), the meaning of A and C are –
(a) 2nd order partial derivative of the objective function (f) with respect to x and y respectively.
(b) 2nd order partial derivative of $\partial f/\partial x$ with respect to y
(c) Both (a) and (b)
(d) Only (a) but not (b)

Question 400 : -

A price discriminating Monopolist Firm operates in –
(a) Such a Market where it is the sole supplier.
(b) More than one Market.
(c) Markets where it sells same product but in different prices.
(d) All of the above.

Question 401 : -

In the expression $D = AC - B^2$ used for describing the sufficient conditions for a dual variable unconstrained optimization the term D is known as –

(a) Hessian Matrix of order 2

(b) Determinant for Hessian Matrix of order 2.

(c) Matrix of partial derivatives of order 2.

(d) Determinant of the Matrix of partial derivatives

Question 402 : -

For a dual plant Monopolist Firm with respective production costs C_1 & C_2 in the two plants, the necessary condition of equilibrium is

(a) $MC_1 = MC_2 \neq MR$

(b) $MC = MR$

(c) $MC_1 = MC_2 = MR$

(d) $MC_1 = MR_1$ & $MC_2 = MR_2$

Question 403 : -

Use of Lagrange's Multiplier is seen while –

(a) Solving a problem of unconstrained optimization with single variable.

(b) Solving a problem of optimization with inequality constraints.

(c) Solving a problem of optimization with one equality constraint.

(d) Solving a problem of optimization having no constraint.

Question 404 : -

For a firm the total cost function is $C(x) = -0.5x^2 + 11x + 600$. Which of the following statement is incorrect?

(a) Average variable cost function is $AVC(x) = -0.5x + 11$

(b) Marginal cost function is $MC(x) = -x + 11$

(c) Cost of producing 10 units is ` 710/-

(d) Average cost function is $AC(x) = -0.5x + 11 + 600/x$

Question 405 : -

Which one of the following statement is not correct?

(a) Average Revenue of a Firm is same as the price at which its product is sold.

(b) Total Profit is the product of quantity sold and the difference of Average Revenue and Average Cost.

(c) When Marginal Revenue is zero then Total Revenue is maximum

(d) None of the above.

Answers:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
d	a	a	b	c	b	b	d	d	d	b	c	c	c	d

B. NUMERICAL QUESTIONS

⊙ Comprehensive Numerical Problems

1. A manufacturing company selling two wheelers (x) and three wheelers (y) has the following Demand functions $p_x = 40 - 0.02x - 0.01y$ and $p_y = 80 - 0.06y - 0.01x$. Find the Revenue maximizing levels of output and price of the Two Wheelers as well as Three Wheelers. What is the maximum Total Revenue? The prices are in ` '000. Ensure the Total Revenue obtained is maximum by 2nd Order derivative test.
2. The Production function of a Firm is given as $Q = f(K,L) = K^{0.5}L^{0.25}$ and the prices of Capital (K) and Labour (L) are respectively w and r. Derive Cost function of the Firm. Find the cost minimizing combination of Capital and Labour.
3. A manufacturer estimates his Annual Sales (in units) as a function of the expenditure made for Social Media and TV Advertising as $Z = 50000x + 40000y - 10x^2 - 20y^2 - 10xy$, where Z denotes Number of TVs sold per year and x & y denote Amounts spent on TV & Social Media Advertising in ` '000. Determine how much amounts should be spent on the two types of Advertising in order to maximize the number of TVs sold.
4. A monopolist offers 2 products which have the demand functions given as $q_1 = 14 - p_1/4$ & $q_2 = 24 - p_2/2$. The monopolist's joint cost function is $C(q_1, q_2) = (q_1)^2 5q_1 q_2 + (q_2)^2$. Determine the quantities to be sold in order to maximize the Total Profit.
5. If the relation between Total Cost (y) and Output (x) is $y = 3x\left[\frac{x+7}{x+5}\right] + 5$, prove that the marginal cost falls continuously as the output increases.

Answers:

1. Revenue maximising output of two and three wheelers are respectively 727 and 545 numbers and the corresponding prices are ` 20000/- and ` 40000/- Maximum Total Revenue = ` 36,340,000/-
2. Cost function is – $C = rk + wl$ & Cost minimizing combination of Labour and Capital is given as

$$K = 3\sqrt{[2W/r)Q^4]} \text{ and } L = 3\sqrt{\left[\left(\frac{r^2}{4w^2}\right)Q^2\right]}$$

3. Amounts to be spent on TV and Social Media Advertising are respectively ` 2285720/- and ` 428570/-
4. The quantities to be sold are $q_1 = 2.75$ and $q_2 = 5.7$.

BUSINESS FORECASTING

Question 406 : -

In Exponential Smoothing Method which one of the following is true?

(a) $0 \leq a \leq 1$ and high value of a is used for stable demand.

(b) $0 \leq a \leq 1$ and high value of a is used for unstable demand.

(c) $a \geq 1$ and high value of a is used for stable demand.

(d) a ≤ 0 and high value of a is used for unstable demand.

Question 407 : -

Which of the following is not a Casual Forecasting Method?

(a) Trend adjusted Exponential Smoothing

(b) Econometric models

(c) Linear Regression

(d) Multiple Regression

Question 408 : -

Which of the following is a Forecasting technique?

(a) PERT / CPM

(b) Exponential Smoothing

(c) Gantt Chart

(d) Control Chart

Question 409 : -

The number of averaging period in the Simple Moving Average Method of forecasting is increased for greater smoothing but at the cost of –

(a) Accuracy

(b) Stability

(c) Visibility

(d) Responsiveness to changes

Question 410 : -

In a Time Series forecasting model, the demands for five time periods are 10, 13, 15, 18 and 22. A linear regression fit resulted in the equation $y_t = 6.9 + 2.9t$, where y_t is the forecast for the period t. The sum of the absolute deviations for the five data with respect to their corresponding forecasts (taking t = 1 for the first one) is

(a) 2.3

(b) 0.2

(c) 1.2

(d) 2.2

Question 411 : -

Which of the following is not a part of Quantitative type of Forecasting Model

(a) Moving Average

(b) Simple Average

(c) Delphi Method

(d) Exponential Smoothing

Question 412 : -

Which of the following Forecasting technique uses three types of participants: Decision Makers, Staff personnel and Respondents?

(a) Expert's Opinion

(b) Sales Force Survey

(c) Consumer Survey

(d) Delphi Method

Question 413 : -

Sales data for the numbers sold for a particular product during January to May 2007 shows the values 10, 11, 16, 19 and 25. Regarding forecast for the month of June which one of the following statement is true?

(a) Moving Average will forecast a higher value compared to regression.

(b) Exponential Smoothing will forecast a higher value compared to regression

(c) Regression will forecast a higher value compared to moving average.

(d) None of the above.

Question 414 : -

The Time Series forecasting method that gives equal weightage to each of the N most recent observations is –

(a) Moving Average Method

(b) Exponential Smoothing with linear Trend

(c) Triple Exponential Smoothing

(d) None of the above

Question 415 : -

Which of the following is not a forecasting technique?

(a) Trend line estimate

(b) Delphi Method

(c) Hungarian Method

(d) Judgemental technique

Question 416 : -

In Simple Exponential Smoothing forecast, to give higher weightage to recent demand information, the smoothing constant must be close to –

(a) -1

(b) 0

(c) 0.5

(d) 1

Question 417 : -

Which of the following is not true for forecasting?

(a) Forecasts are rarely perfect.

(b) The underlying casual system will remain same in the future.

(c) Forecast for group of items is accurate than individual item

(d) Short range forecasts are less accurate than long range forecasts.

Question 418 : -

In which of the following forecasting technique, data obtained from past experience is analysed?

(a) Judgemental forecast

(b) Time Series forecast

(c) Associative model

(d) All of the above

Question 419 : -

Delphi Method is used for –

(a) Judgemental forecast

(b) Time Series forecast

(c) Associative model

(d) All of the above

Question 420 : -

Short term regular variations related to the calendar or time of the day is known as –

(a) Trend

(b) Seasonality

(c) Cycles

(d) Random variations

Question 421: -

A linear Trend equation has the form –

(a) F = a - bt

(b) F = a + bt

(c) F = 2a – bt

(d) F = 2a + bt

Question 422 : -

The actual demand for a period is 100 units. But forecast demand was 90 units. The forecast error is –

(a) – 10

(b) 10

(c) 5

(d) None of the above

Question 423 : -

Which of the following is not a forecasting technique?

(a) Judgemental

(b) Time Series

(c) Time Horizon

(d) Associative

Question 424 : -

Which of the following is not a Qualitative Forecasting technique?

(a) Surveys of consumer expenditure plans

(b) Perspective of foreign advisory councils

(c) Consumer intention polling

(d) Time Series analysis

Question 425 : -

Which of the following is not one of the four types of variation that is estimated in the Time Series analysis?

(a) Predictable

(b) Trend

(c) Cyclical

(d) Irregular

Question 426 : -

In Time Series Analysis which source of variation can be estimated by the ratio to trend method?

(a) Cyclical

(b) Trend

(c) Seasonal

(d) Irregular

Question 427 : -

A qualitative forecast

(a) Predicts the quality of a new product

(b) Predicts the direction but not the magnitude of change in a variable.

(c) Is a forecast that is classified on a numerical scale from 1 (poor quality) to 10 (perfect quality).

(d) Is a forecast that is based on econometric methods.

Question 428 : -

The first step in Time Series analysis is to –

(a) Perform preliminary Regression calculations.

(b) Calculate a moving average.

(c) Plot the data on a graph

(d) Identify relevant correlated variables.

Question 429 : -

If the estimate of the Trend Component is 158.2, the estimate of Seasonal Component is 94%, the estimate of the Cyclical Component is 105% and the estimate of the Irregular Component is 98%, then the multiplicative model will produce a forecast of –

(a) 1.53

(b) 1.53%

(c) 153.02

(d) 153,020,532

Question 430 : -

From the first two supplied values of a Time Series and its corresponding Exponential Smoothing forecast as given below, the forecast for the time period 3, assuming Smoothing Constant = 0.3, will be

Time Period (t)	Value (y_t)	Exponential Smoothing Forecast (u_t)
1	18	18
2	22	18

(a) 18

(b) 19.2

(c) 20

(d) 40

Question 431 : -

For the Regression Equations y = 0.516x + 33.73 and x = 0.512y + 32.52, the Arithmetic Mean values of x and y are nearly

(e) 67.6 and 68.6
(f) 68.6 and 68.6
(g) 67.6 and 58.6
(h) 68.6 and 58.6

Question 432 : -

For a bivariate dataset (x,y), if the Means, Standard Deviations and Correlation Coefficient are respectively x = 1, y = 2, σ_x= 3, σ_y = 9 and r = 0.8. The regression line y on x is –

(i) y = 1 + 2.4(x -1)
(j) y = 2 + 0.27(x – 1)
(k) y = 2 + 2.4(x – 1)
(l) y = 1 + 0.27(x – 2)

Question 433 : -

The data about Sales and Advertisement Expenditure of a firm is given below

	Sales (` Crores)	**Advertisement Expenditure (` Crores)**
Mean	40	6
S.D	10	1.5

The Correlation Coefficient between Sales and Advertisement Expenditure is 0.9. The likely Sales for a proposed Advertisement Expenditure of ` 10 Crores is –

(a) ` 64 Crores
(b) ` 67 Crores
(c) ` 70 Crores
(d) ` 58 Crores

Question 434 : -

Given the Regression Lines x + 2y – 5 = 0 and 2x + 3y – 8 = 0 and Var (X) = 12. The value of Var (Y) is –

(e) 3/4
(f) 4/3
(g) 16

(h) 4

Question 435 : -

The equations of the two lines of Regression are 4x + 3y + 7 = 0 and 3x + 4y + 8 = 0. The Coefficient of Correlation between x and y is –

(i) 1.25
(j) 0.25
(k) – 0.75
(l) 0.92

Answers:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
b	a	b	d	d	c	d	c	a	c	d	d	b	a	b
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
b	b	c	d	a	c	b	c	c	b	a	c	a	d	c

B. NUMERICAL QUESTIONS

⊙ Comprehensive Numerical Problems

1. A company dealing in logistics business has a business wing named Ship Unloading. During the years 2020 and 2021 they have the following quarterly figures (in tonnage) of material unloaded from Ships.

Year	**2020**				**2021**			
Quarter	I	II	III	IV	I	II	III	IV
Material Unloaded	180	168	159	175	190	205	180	182

If the forecast for the first quarter of 2020 is 175 tons then what is the forecast figure for the first quarter of 2022? Use a Smoothing coefficient of 0.1

2. The number of quarterly traffic accidents in a Metro city during 2018-2020 are as below –

Year / Quarter	**1st**	**2nd**	**3rd**	**4th**
2018	165	135	140	180

2019	152	121	127	163
2020	140	100	105	158

Find the Seasonal Indices by Trend Ratio Method, assuming a linear trend for the data.

3. For the following series of observations verify that the 4 yearly Centred Moving Average is equivalent to the 5 yearly Weighted Moving Average with weights 1, 2, 2, 2, 1 respectively.

Year	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Sales ('0000 `)	2	6	1	5	3	7	2	6	4	8	3

4. In the following dataset consider y as the Response Variable and x_1 and x_2 as the Predictor Variables to find the Linear Regression model. Interpret the estimators of the model.

y	140	155	159	179	192	200	212	215
x_1	60	62	67	70	71	72	75	78
x_2	22	25	24	20	15	14	14	11

5. While calculating the Coefficient of Correlation between two variables x and y, the following results were obtained: N = 25, $\Sigma x = 125$, $\Sigma y = 100$, $\Sigma x^2 = 650$, $\Sigma y^2 = 460$, $\Sigma xy = 508$. It was however discovered later on that two pairs of observation (x,y) were copied as (6,14) and (8,6) instead of (8,12) and (6,8) respectively. Determine the correct equations of the two Regression Lines.

Answers:

1. 178.6 Tons
2. 105 for 1st quarter, 83 for 2nd Quarter, 89 for 3rd Quarter and 123 for 4th Quarter.
4. $y = -6.867 + 3.148\ x_1 - 1.656\ x_2$
5. $9x - 5y - 25 = 0$ and $4x - 5y = 0$

DATA ANALYTICS

Question 436 : -

Tableau is a -

a. Business Intelligence Tool
b. Visualisation Tool
c. Both (a) and (b)
d. None of the above

Question 437 : -

Which of the following statement is correct?

a. Functioning of ETL Tool is same as that of ELT Tool.
b. For Data Analytics the purpose of ETL Tool is same as that of ELT Tool.
c. Both (a) and (b)
d. None of the above

Question 438 : -

Which of the following statement is incorrect?

a. Microsoft Excel is most popular among all the available spreadsheets.
b. Zoho Analytics is a tool used for Financial Data analysis.
c. Visualisation Tools are the Reporting Tools.
d. None of the above.

Question 439 : -

Prescriptive Analytics is very important because –

a. It tells about the action to be taken.
b. It tells about what is likely to happen.
c. It tells about how something has happened.
d. It tells about what has happened.

Question 440 : -

Which of the following has no relation to Business Intelligence?

a. A set of business analytics solutions to retrieve, analyse and transform data into useful business sights
b. Visualisation Tools are primarily BI Tools.
c. ABS Glue is a tool used for the purpose of Business Intelligence.
d. Embedded Analytics is an important part of any Business Intelligence tool.

Question 441 : -

Which of the following is related to Financial Data Analytics?

a. Value driver analytics
b. Financial ratio analytics
c. Predictive sales analysis
d. All the above

Question 442 : -

Analysis of a dataset has revealed the fact that profit of a business has reduced for the financial year 2021-22. What category of data analytics it comes under?

a. Descriptive Analytics
b. Predictive Analytics
c. Diagnostic Analytics
d. Prescriptive Analytics

Question 443 : -

Script Ends – is related to which type of programming language?

a. R Programming
b. SAS
c. Python
d. SPSS

Question 444 : -

Which one of the following is a Key feature of SAS language?

a. Capability of handling data analysis related to Operations Research and Project Management.
b. Capability of report formation with perfect graphs.
c. Capability to interact with multiple host systems
d. All the above

Question 445 : -

Which one of the following is not a spreadsheet?

a. Google Sheets
b. MS Excel
c. EViews
d. Quip

Answers:

1	2	3	4	5	6	7	8	9	10
c	b	d	a	c	d	a	c	d	c

⊙ **State True or False**

1. Data Analytics encompasses many diverse types of data analysis.
2. Purpose of Predictive Analytics and Prescriptive Analytics are same.

3. There is no hypothesis stated in Confirmatory data analytics.
4. Power BI is a business intelligence tool but more popular as data visualisation tool.
5. The process of Data Mining is also known as the process of data discovery.
6. Ease of using multiple databases is not a necessity for Visualisation Tools.
7. Use of cloud data storage system to aggregate diverse datasets in a common location is common for Business Intelligence software.
8. Rating of different BI Software products are based on their capability of Data Analytics, Natural language processing, Real time reporting and Embedded analytics
9. In data analytics the term Mart is related to a place where purchase of data is done.
10. R Programming is incapable of handling any statistical data analysis and that's why SAS is developed.

Answer:

1	2	3	4	5	6	7	8	9	10
T	F	F	T	T	F	T	T	F	F

⊙ **Fill in the blanks**

1. EViews is a statistical and _____ tool.
2. Python is closer to _____ language.
3. QuickBooks is a _____ Analytics tool.
4. Tools handling extract, transform and load functions of data are known as ____ tool.
5. CRAN is related to _____

Answer:

1.	Econometric	**2.**	English
3.	Financial	**4.**	ETL
5.	R programming		