Time Allowed: 3 Hours   **Full Marks: 100**

The figures in the margin on the right side indicate full marks.

SECTION – A (Compulsory)

1.   **Choose the correct option:**   **[15 x 2=30]**

(i)   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

(ii)   DMIADV is a methodology associated with

a.   Pareto Analysis

b.   PRAISE

c.   Six Sigma

d.   None of the above

(iii)   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

(iv)   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%

(v)   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

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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

(vi)   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

(vii)   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

(viii) 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

(ix)   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)

(x)   Tableau is a –
       a.   Business Intelligence Tool
       b.   Visualisation Tool
       c.   Both (a) and (b)
       d.   None of the above

(xi)   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

(xii) 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

(xiii) 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

(xiv) 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

(xv)   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 –
       a.   1.25
       b.   0.25
       c.   – 0.75
       d.   0.92

SECTION – B

Answer any "5" Questions from Question No. 2 to Question No. 8 in Section "B". Each Question Carries 14 marks. [5 x 14 = 70]

2. Forward and Foundry Ltd. is feeling the effects of a general recession in the industry. Its budget for the coming half year is based on an output of only 500 tons of casting a month which is less than half of its capacity. The prices of casting vary with the composition of the metal and the shape of the mould, but they average ₹ 175 a ton. The following details are from the Monthly Production Cost Budget at 500 tone levels:

	Core Making ₹	Melting and Pouring ₹	Moulding ₹	Cleaning and Grinding ₹
Labour	10,000	16,000	6,000	4,500
Variable overheads	3,000	1,000	1,000	1,000
Fixed overhead	5,000	9,000	2,000	1,000
	18,000	26,000	9,000	6,500
Labour and O.H rate per direct labour hour	9.00	6.50	6.00	5.2

Operation at this level has brought the company to the brink of break-even. It is feared that if the lack of work continues, the company may have to lay off some of the most highly skilled workers whom it would be difficult to get back when the volume picks up later on. No wonder, the work's Manager at this Juncture, welcomes an order for 90,000 casting, each weighing about 40 lbs., to be delivered on a regular schedule during the next six months. As the immediate concern of the Works Manager is to keep his work force occupied, he does not want to lose the order and is ready to recommended a quotation on a no-profit and no-loss basis.

Materials required would cost ₹ 1 per casting after deducting scrap credits. The direct labour hour per casting required for each department would be:

Core Making	0.09
Melting and pouring	0.15
Moulding	0.06
Cleaning and Grinding	0.06

Variable overheads would bear a normal relationship to labour cost in the melting and pouring department and in the moulding department. In core making, cleaning and grinding however, the extra labour requirements would not be accompanied by proportionate increases in variable overhead. Variable overhead would increase by ₹1.20 for every additional labour hour in core making and by 30 paise for every additional labour hour in cleaning and grinding. Standard wage rates are in operation in each department and no labour variances are anticipated. To handle an order as large as this, certain increases in factory overheads would be necessary amounting to ₹ 1,000 a month for all departments put together. Production for this order would be spread evenly over the six months period.

You are required to:

(a) Prepare a revised monthly labour and overhead cost budget, reflecting the addition of this order.

(b) Determine the lowest price at which quotation can be given for 90,000 castings without incurring a loss. [14]

3. **(a)** A Company with two manufacturing divisions is organised on profit centre basis. Division 'A' is the only source for the supply of a component that is used in Division B in the manufacture of a product KLIM. One such part is used in each unit of the product KLIM. As the demand for the product is not steady, Division B can obtain orders for increased quantities only by spending more on sales promotion and by reducing the selling prices. The Manager of Division B has accordingly prepared the following forecast of sales quantities and selling prices. **[7]**

Sales units per day	Average Selling price per unit of KLIM (₹)
1,000	5.25
2,000	3.98
3,000	3.30
4,000	2.78
5,000	2.40
6,000	2.01

The manufacturing cost of KLIM in Division B is ₹3,750 for first 1,000 units and ₹750 per 1,000 units in excess of 1,000 units. Division A incurs a total cost of ₹1,500 per day for an output to 1,000 components and the total costs will increase by ₹900 per day for every additional 1,000 components manufactured. The Manager of Division A states that the operating results of his Division will be optimised if the transfer price of the component is set at ₹1.20 per unit and he has accordingly set the aforesaid transfer price for his supplies of the component to Division A.

You are required to:

(a) Prepare a schedule showing the profit at each level of output for Division A and Division B.

(b) Find the profit of the company as a whole at the output level which

    (i) Division A's net profit is maximum.

    (ii) Division B's net profit is maximum.

(c) If the Company is not organised on profit centre basis, what level of output will be chosen to yield the maximum profit.

(b) A company has estimated the following demand level of its product: **[7]**

Sales Volume (units)	10000	12000	14000	16000	18000
Probability	0.10	0.15	0.25	0.30	0.20

It has assumed that the sales price of ₹ 6 per unit, marginal cost of ₹ 3.50 per unit, and fixed costs of ₹ 34,000. What is the probability that:

(a) The company will break-even in the period?

(b) The company will make a profit of at least ₹ 10,000?

4. (a) Modern Co produces 3 products, A, B and C, details of which are shown below: **[7]**

Particulars	A	B	C
Selling price per unit (₹)	120	110	130
Direct material cost per unit (₹)	60	70	85
Variable overhead (₹)	30	20	15
Maximum demand (units)	30,000	25,000	40,000
Time required on the bottleneck resource (hours per unit)	5	4	3
Resources (hours per unit)	12	10	15

There are 3,20,000 bottleneck hours available each month.

Required:

Calculate the optimum product mix based on the throughput concept.

(b) Narrate the principles, practices, and tools of lean accounting. **[7]**

5. (a) S.V. Ltd. manufactures BXE by mixing three raw materials. For every batch of 100Kg. of BXE, 125 Kg. of raw materials are used. In April 2021, 60 batches were prepared to produce an output of 5,600 Kg. of BXE. The standard and actual particulars for April 2021 are as under:

[7]

Raw material	Standard Mix %	Standard Price per kg	Actual Mix %	Actual Price per kg	Quantity of raw materials purchased kg
A	50	20	60	21	5,000
B	30	10	20	8	2,000
C	20	5	20	6	1,200

Calculate relevant material variances.

(b) Vinak Ltd. has furnished you the following information for the month of February, 2017.

	Budget	Actual
Output (Units)	30,000	32,500
Hours	30,000	33,000
Fixed Overhead	₹45,000	₹ 50,000
Variable overhead	60,000	68,000
Working days	25	26

Calculate Variances. **[7]**

6. (a) Mr. Lal is on a low cholesterol diet. During lunch at the office canteen he always chooses between two particular types of meal – Type A and Type B. the table below lists the amount of protein, carbohydrates and vitamins each meal provides along with the amount of cholesterol (which he is trying to minimize). He needs at least 200 grams of protein, 960 grams of carbohydrates and 40 grams of vitamins for lunch each month. Over this time period, how many days should he have Type A meal and how many days the Type B meal so that he gets adequate amount of protein, carbohydrates and vitamins and at the same time minimizes his cholesterol intake. Formulate LPP.

[7]

	Type A meal	Type B meal
Protein (Grams)	8	16
Carbohydrates (Grams)	60	40
Vitamins (Grams)	2	2
Cholesterol (Milli grams)	60	50

(b) Patients arriving at a village dispensary are treated by a doctor on a first-come-first-served basis. The inter-arrival time of the patients is known to be uniformly distributed between 0 and 80 minutes, while their service time is known to be uniformly distributed between 15 and 40 minutes. It is desired to simulate the system and determine the average time a patient has to be in the queue for getting service and the proportion of time the doctor would be idle.

Carry out the simulation using the following sequences of random numbers. The numbers have been selected between 00 and 80 to estimate inter-arrival times and between 15 and 40 to estimate the service times required by the patients. [7]

Series 1	07	21	12	80	08	03	32	65	43	74
Series 2	23	37	16	28	30	18	25	34	19	21

7. **(a)** The following table gives the activities and other relevant information related to "Making of a loaf".

Activity	Preceded by	Elapsed Time (Minutes)
A - Weigh ingredients	-	1
B - Mix ingredients	A	3
C - Dough rising time	B	60
D - Prepare tins	-	1
E - Pre-heat oven	-	10
F - Knock back dough and place in tins	C&D	2
G - 2nd dough rising time	F	15
H - Cooking time	E&G	45

Draw a Network diagram. Also find the Earliest and Latest Times of each Event of the Network. Identify the different paths of the Network and their corresponding durations. Which path is critical? Find the time required to complete the job. [7]

(b) The usual Learning Curve model is $Y = ax^b$ where

Y is the average time per unit for x units and 'a' is the time for first unit

x is the cumulative number of units

b is the learning coefficient and is equal to $(\log 0.8)/(\log 2) = -0.322$ for a learning rate of 80%

Given that a = 10 hours, you are required to Calculate:

(i) The average time for 20 units.

(ii) The total time for 30 units.

(iii) The time for units 31 to 40.

Given that log 2 = 0.301, Antilog of 0.5811 = 3.812

log 3 = 0.4771, Antilog of 0.5244 = 3.345.

log 4 = 0.6021, Antilog of 0.4841 = 3.049. [7]

8.   (a)   Solve the Game using Domine Principle $\begin{bmatrix} 15 & 2 & 3 \\ 6 & 5 & 7 \\ -7 & 4 & 0 \end{bmatrix}$ **[7]**

      (b)   Find trend values of the following year wise data of Goods carried by a fleet of trucks of a Transport Company having pan India network using the Moving Average Method. [Assume a 4 yearly cycle]

[7]

Year	1975	1976	1977	1978
Goods carried (Tons)	2204	2500	2360	2680
Year	1979	1980	1981	1982
Goods carried (Tons)	2424	2634	2904	3098
Year	1983	1984	1985	1986
Goods carried (Tons)	3172	2952	3248	3172