N15-110

CC-304 : Operations Research & Quantitative Techniques

Time : 3 Hours]   **[Max. Marks : 70**

1.   (a)   Define :   **4**
   - (i)   Objective function
   - (ii)   Constraints
   - (iii)   Feasible solution
   - (iv)   Optimum solution

   OR

   Write uses of Linear Programming Problem.

   (b)   Write dual of following :   **5**

   Minimize $Z = 3x + 5y$;

   Subject to : $-3x + 4y \leq 12$,

                $2x - y \geq -2$,

                $2x + 3y \geq 12$,

                $x, y \geq 0$

   OR

   Write dual of following :

   Maximize $Z = 2x + y$;

   Subject to : $3x + y = 3$,

                $x + 2y \leq 4$,

                $4x + 3y \leq 6$,

                $x, y \geq 0$

   (c)   Solve the following problem :   **5**

   Maximize $Z = 2.5x + 7y$;

   Subject to : $3x + 2y \leq 16$,

                $x + y \leq 8$,

                $x \leq 2$,

                $y \leq 5$,

                $x, y \geq 0$

   OR

   One unit of product X contributes ₹ 10 and for product Y per unit contribution is ₹ 7. One unit of product X requires 3 units of raw material and 2 Hrs. of labour. One unit of product Y requires 1 unit of raw material and 1 Hr. of labour. Availability of raw material is 48 units and 40 Hrs. of labour can be used. Formulate the problem and solve it by graphical method.

2. (a) Discuss least cost method to solve transportation problem. **4**

<div align="center">OR</div>

Express transportation problem in standard form of LPP.

(b) Find initial solution of following problem by North-West corner method : **5**

	X	Y	Z	Supply
A	6	4	24	3
B	10	6	18	5
C	26	21	6	6
Demand	2	4	4	

<div align="center">OR</div>

Find initial solution by Vogel's Method :

	P	Q	R	Supply
A	3	7	1	200
B	2	9	12	300
C	10	2	5	500
Demand	350	150	500	

(c) Check whether the given solution optimum or not. If it is not then find it. **5**

X	[10] 4	19	[10] 22	[30] 11	[50] 0
Y	[30] 0	9	14	14	0
Z	6	[20] 6	[50] 16	14	0

<div align="center">OR</div>

Find alternate optimum solution of given problem :

	D1	D2	D3	D4
01	[40] 6	[30] 1	9	3
02	11	[5] 5	[50] 2	8
03	[25] 10	12	4	[45] 7

3. (a) State advantages of PERT. **4**

<div align="center">OR</div>

Define :
(i) Optimistic Time
(ii) Event
(iii) Free Float Time
(iv) EFT

(b) Find the expected time of following activities. Draw PERT diagram. Also find critical path :   **5**

Activity	Optimistic Time	Most Likely Time	Pessimistic Time
1 – 2	7	12	13
1 – 3	7	10	12
2 – 5	8	13	15
3 – 4	10	12	22
4 – 5	10	14	18

OR

Find critical path for following activities :

Activity	Preceding Activity	Estimated Time
A	–	2
B	A	3
C	B	4
D	–	5
E	D	2
F	C, E	5

(c) Estimate LST and LFT for following activities :   **5**

Activity :	1 – 2	2 – 4	2 – 3	3 – 4	3 – 5	4 – 5	3 – 6	5 – 6	4 – 6
Duration :	13	12	13	10	13	17	12	16	15

OR

Estimate Total Float Time and Free Float Time for given activities :

Activity :	1 – 2	1 – 3	1 – 4	2 – 3	2 – 5	3 – 5	4 – 5
Time :	4	2	5	7	7	2	5

4. (a) Explain :   **4**
   (i) Pure strategy
   (ii) Saddle Point
   (iii) Pay off
   (iv) Maxi-min Principle

   OR

   Why assignment problem is called a special case of LPP ?

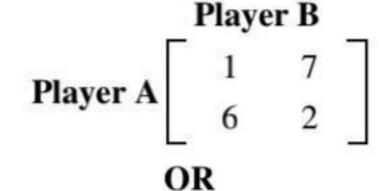   (b) Solve the following assignment problem to maximize total profit :   **5**

   (Profit in ₹)

	P	Q	R	S
A	3	4	11	9
B	5	7	8	9
C	5	6	6	7
D	4	6	8	8

   OR

Solve the following assignment problem :

(Profit in ₹)

	A	B	C	D	E
P	9	6	5	4	2
Q	7	6	3	2	8
R	6	7	4	5	3
S	2	6	4	9	6

(c) Determine the optimal strategies and value of the game :   **5**

Player B

$$\text{Player A} \begin{bmatrix} 1 & 7 \\ 6 & 2 \end{bmatrix}$$

OR

Is the following game fair ?

Payer B

$$\text{Player A} \begin{bmatrix} -3 & -1 & -1 & 4 & 2 \\ 2 & 1 & 0 & 1 & 1 \\ -5 & -4 & -1 & -3 & 5 \\ 4 & 2 & -5 & 1 & -7 \end{bmatrix}$$

5. Answer the following questions :   **14**
   (1) All variables in LPP must take non-negative values. (True/False)
   (2) Most of constraints in LPP are expressed as _____.
   (3) A basic feasible solution is said to be _____ if values of all basic variables are non zero and positive.
   (4) If total supply _____ total demand then dummy column is added to make it balance.
   (5) The solution to transportation problem with m rows and n columns is non-degenerate if No. of occupied allocations are equal to _____.
   (6) If opportunity costs are _____ in all unoccupied cells then initial solution is unique optimum solution.
   (7) The assignment problem is a special case of transportation problem where all requirements equal to _____.
   (8) All dummy rows or columns in the assignment problem are assumed to be zero. (True / False)
   (9) The method used for solving an assignment problem is called _____.
   (10) In assignment problem the no. of allocations in each row and column are _____.
   (11) If there are only two strategies, the payoff matrix has a saddle point. (True/False)
   (12) The rules of _____ are used to reduce the size of payoff matrix.
   (13) PERT is referred to as an activity oriented technique. (True/False)
   (14) The objective of network analysis is to minimize total project cost. (True/False)

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