LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **MATHEMATICS**

SIXTH SEMESTER – **NOVEMBER 2023**

UMT 6502 – OPERATIONS RESEARCH

Date: 03-11-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

PART – A

Answer ALL the questions: **(10 x 2 = 20 Marks)**

1. Write the general mathematical formulation of linear programming problem.
2. What are the three types of additional variables
3. When a solution is said to be a basic solution in linear programming problem.
4. Define unbounded solution in LP problem.
5. Name the three different methods to obtain an initial basic feasible solution in transportation problem.
6. How to convert an unbalanced assignment problem to a balance assignment problem.
7. Define strategy in game theory.
8. When a game is said to be a fair game?
9. Expand the term PERT.
10. What are the different types of floats in networking?

PART – B

Answer any FIVE questions: **(5 x 8 = 40 Marks)**

11. Use the graphical method to solve the following linear programming problem.
    Max $z = 15x_1 + 10x_2$
    Subject to the constraints $4x_1 + 6x_2 \leq 360$; $3x_1 \leq 180$; $5x_2 \leq 200$ and $x_1, x_2 \geq 0$.
12. A company sells two different products A and B, making a profit of Rs 40 and Rs 30 per unit, respectively. They are both produced with the help of a common production process and are sold in two different markets. The production process has a total capacity of 30,000 man-hours. It takes three hours to produce a unit of A and one hour to produce a unit of B. The market has been surveyed and company officials feel that the maximum number of units of A that can be sold is 8,000 units and that of B is 12,000 units. Subject to these limitations, products can be sold in any combination. Formulate this problem as an LP model to maximize profit.
13. Use the dual simplex method to solve the LP problem: Maximize $Z = -3x_1 - 2x_2$ subject to the constraints (i) $x_1 + x_2 \geq 1$, (ii) $x_1 + x_2 \leq 7$ (iii) $x_1 + 2x_2 \geq 10$, (iv) $x_2 \leq 3$ and $x_1, x_2 \geq 0$.

14. Find the initial basic feasible solution for the given problem using least cost method.

	D1	D2	D3	D4	Supply
S1	21	16	15	3	11
S2	17	18	14	23	13
S3	32	27	18	41	19
Demand	6	10	12	15	

15. For the given problem, find the maximum expected sales by using the assignment method.

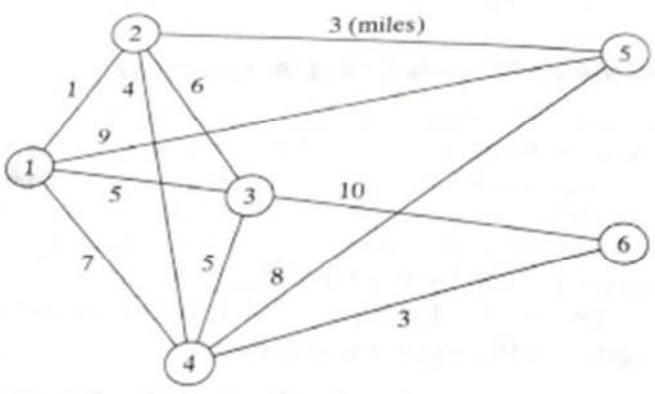
	I	II	III	IV
A	42	35	28	21
B	30	25	20	15
C	30	25	20	15
D	24	20	16	12

16. In a game of matching coins with 2 players, A wins 1unit of value when there are 2 heads, wins nothing when there are 2 tails and losses $\frac{1}{2}$ unit of value when there is one head and one tail. Determine the payoff matrix, the best strategies of each player and the value of the game.

17. Solve the following game graphically:

	Player B			
Player A	B1	B2	B3	B4
A1	2	2	3	-2
A2	4	3	2	6

18. A TV cable company is in the process of providing cable service to five new housing development areas. The following figure depicts possible TV linkages among the five areas in which the TV company is labelled 1 and the areas are labelled from 2 to 6. The cable miles are shown on each arc. Determine the most economical cable network.



PART – C

Answer any TWO questions: **(2 x 20 = 40 Marks)**

19. Use simplex method to solve the following linear programming problem.
Max $z = 3x_1 + 5x_2 + 4x_3$
Subject to the constraints $2x_1 + 3x_2 \leq 8$; $2x_2 + 5x_3 \leq 10$; $3x_1 + 2x_2 + 4x_3 \leq 15$ and $x_1, x_2, x_3 \geq 0$.

20. By using Modified distribution method, solve the transportation problem.

	A	B	C	Supply
X	4	8	8	76
Y	16	24	16	82
Z	8	16	24	77
Demand	72	102	41	

21. Solve the following game.

	Player B			
Player A	B1	B2	B3	B4
A1	2	-2	4	1
A2	6	1	12	3
A3	-3	2	0	6
A4	2	-3	7	1

22. For the given data:

Activity	A	B	C	D	E	F	G	H	I
Predecessors	-	A	B	B	C	D	C	E, F	G, H
Duration	5	7	2	3	1	2	1	3	10

(a) Draw the network diagram.
(b) Find the critical path.
(c) Calculate the project duration.

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