LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SIXTH SEMESTER – **APRIL 2022**

UMT 6502 – OPERATIONS RESEARCH

Date: 17-06-2022 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

SECTION-A

Answer All Questions (10 x 2 = 20)

1. What is surplus variable?
2. Write the standard form of the LPP.
3. Define Basic Feasible Solution
4. What is the advantage of dual simplex method?
5. What is degeneracy in Transportation problem?
6. State any two areas for the application of assignment problem.
7. Solve the game $\begin{bmatrix} 1 & 3 & 1 \\ 0 & -4 & -3 \\ 1 & 5 & -1 \end{bmatrix}$.
8. Define two person zero sum game.
9. Define dummy activity.
10. Define Free float.

SECTION-B

Answer Any Five Questions **(5 x 8 = 40)**

11. Solve the following Linear Programming Problem by Graphical Method.

Minimize $Z = 2x_1 + x_2$

Subject to constraints

$$5\,x_1 + 10\,x_2 \le 50$$
$$x_1 + x_2 \ge 1$$
$$x_1 \le 4$$

and $x_1, x_2 \ge 0$.

12. Using dual simplex method to the LPP

Maximize $Z = 2x_1 + 2x_2$

Subject to constraints

$$2x_1 + 4\,x_2 \ge 1$$
$$x_1 + 2x_2 \ge 1$$
$$2x_1 + x_2 \ge 1$$

and $x_1, x_2 \ge 0$.

13. Solve the following transportation problem by using North West Corner Rule.

	D	E	F	G	Supply
A	3	7	6	4	5
B	2	4	3	2	2
C	4	3	8	5	3
Demand	3	3	2	2	

14. Solve the following Assignment problem

		To			
From		A	B	C	D
	A	10	25	15	20
	B	15	30	5	15
	C	35	20	12	24
	D	17	25	24	20

15. Solve the following 2X2 game $\begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix}$.

16. Construct the project network comprised of activities *A* to *L* with the following precedence relationships:

(a) A, B, and C the first activities of the project, can be executed concurrently.
(b) A and *B* precede *D.*
(c) B precedes *E, F,* and *H.*
(d) F and C precede G.
(e) E and *H* precede *I* and *J.*
(I) C, D, F, and *J* precede *K.*
(g) K precedes *L.*
(h) I, G, and *L* are the terminal activities of the project.

17. Write the dual of the following primal LPP

Max $Z = x_1 - 3x_2 - 2x_3$

Subject to \` $3x_1 - x_2 + 2x_3 \leq 7$

$2x_1 - 4x_2 \geq 12$

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

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

18. Use dominance Property to solve the following game

Player A

$$\text{Player B} \begin{pmatrix} 1 & 7 & 2 \\ 6 & 2 & 7 \\ 5 & 1 & 6 \end{pmatrix}$$

SECTION -C

Answer Any Two Questions: **(2 x 20 = 40)**

19. Solve the following Linear Programming Problem by simplex Method.

Maximize $Z = 5x_1 + 4x_2$

Subject to constraints

$4x_1 + 5x_2 \leq 10$

$3x_1 + 2x_2 \leq 9$

$8x_1 + 3x_2 \leq 12$

and $x_1, x_2 \geq 0.$

20. Use Big-M method to solve the LPP :

Minimize $Z = 6\,x_1 + 4\,x_2$

Subject to

$$2\,x_1 + 3x_2 \le 30$$
$$3x_1 + 2\,x_2 \le 24$$
$$x_1 + x_2 \ge 3$$

and $x_1\,,\,x_2 \ge 0.$

21. Find the optimal solution to the following transportation problem by using Vogel's approximation method.

	A	B	C	D	Available
I	19	30	50	10	7
II	70	30	40	60	9
III	40	8	70	20	18
Requirements	5	8	7	14	

22.(a) A project composed of nine activities whose time estimates are given below:

Jobs	1-2	7-8	2-3	3-5	5-8	6-7	4-5	2-4	1-6
a (days)	3	4	6	5	1	3	3	2	2
m(days)	6	19	12	11	4	9	6	5	5
b(days)	15	28	30	17	7	27	15	8	14

(i) Draw the project (ii) Calculate the length variance of the critical path.

(b) Use Graphical method in solving the following game.

Player A

Player B $\begin{pmatrix} 2 & 2 & 3 & -2 \\ 4 & 3 & 2 & 6 \end{pmatrix}$ (10 + 10)

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