



**Part B**

**3 x 6 = 18**

Answer any **Three** questions

**Each answer should not exceed 400 words or two pages**

11. A company produces two types of pens say A and B. Pen A is a superior quality and Pen B is a lower quality. Profits on pen A and pen B are Rs 5 and Rs 3 per pen respectively. Raw materials required for each pen A is twice as that of pen B. The supply of raw material is sufficient only for Rs 1000 pens of B per day. Pen A requires a special clip and only 400 such clips are available per day. For pen B, only 700 clips are available per day. Formulate the problem into a LPP.

12. Solve graphically the following LPP:

$$\text{Max } Z = 2x_1 + 3x_2$$

$$\text{subject to } x_1 + x_2 \leq 30$$

$$0 \leq x_2 \leq 12; \quad x_2 \geq 3;$$

$$x_1 - x_2 \leq 0; \quad 0 \leq x_1 \leq 20$$

13. Explain the procedure of solving LPP using Big-M method.

14. Use Two-Phase method to solve the following LPP:

$$\text{Mini } Z = x_1 + x_2$$

$$\text{subject to } 2x_1 + x_2 \geq 4$$

$$x_1 + 7x_2 \geq 7$$

$$x_1 \geq 0; \quad x_2 \geq 0.$$

15. Describe NWC and VAM to find IBFS in Transportation Problems.

16. Determine the optimum assignment schedule for the given problem.

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

17. Explain two-person zero-sum game by giving suitable examples with its assumptions.

18. In a game of matching coins with two players, suppose A wins one unit of value when there are two tails and loses  $\frac{1}{2}$  unit of value when there is one head and one tail. Determine the payoff matrix, the best strategies for each player and the value of the game to A.

19. Five jobs are performed first on machine X and then on machine Y, The time taken in hours by each job on each machine are given in the table below:

Jobs	A	B	C	D	E
Machine X	6	2	10	4	11
Machine Y	3	7	8	9	5

Determine the optimal sequence for the five jobs that will minimize the elapsed time.

20. Describe the procedure for finding optimal solution for a sequencing problem.

**Part C**

**2 x 11 = 22**

Answer any **Two** questions

**Each answer should not exceed 800 words or four pages**

- 21. i. Discuss briefly about LPP with its assumptions and applications.
- ii. Bring out some exceptional cases in finding the solution of LPP.

22. Reduce the following LPP to the standard form and canonical form

Determine  $x_1 \geq 0$ ;  $x_2 \geq 0$ ,  $x_3 \geq 0$ ; so as to maximize

$$\text{Max } Z = 2x_1 + x_2 + 4x_3$$

subject to  $-2x_1 + 4x_2 \leq 4$ ;

$$x_1 + 2x_2 + 4x_3 \geq 5 ;$$

$$2x_1 + 3x_3 \leq 2.$$

23. An animal feed company must produce atleast 2000kgs of a mixture consisting of ingredients A and B daily. Ingredient A costs Rs 30 per kg and ingredient B Rs 50 per kg respectively. No more than 800 kgs of A can be used and atleast 600 kgs of B must be used. Formulate a mathematical model and find the minimum cost mixture to the problem.

24. Check whether the degeneracy exists for the following LPP.

$$\text{Maximize } Z = 5x_1 + 3x_2$$

subject to  $x_1 + x_2 \leq 2$

$$5x_1 + 2x_2 \leq 10$$

$$3x_1 + 8x_2 \leq 12 , \quad x_1, x_2 \geq 0$$

25. Solve the following transportation problem to maximize the profit.

	W	X	Y	Z	Supply
A	40	25	22	33	100
B	44	35	30	30	30
C	38	38	28	30	70
Demand	40	20	60	30	

26. Obtain the optimum solution for the assignment problem and examine for the alternative solutions.

	A	B	C	D	E
1	1	3	2	3	6
2	2	4	3	1	5
3	5	6	3	4	6
4	3	1	4	2	2

27. Describe in detail about optimal solution of two person zero sum game with example.

28. Solve the game whose pay-off matrix is given below by graphical method.

	<b>B<sub>1</sub></b>	<b>B<sub>2</sub></b>	<b>B<sub>3</sub></b>	<b>B<sub>4</sub></b>
<b>A<sub>1</sub></b>	4	-2	3	-1
<b>A<sub>2</sub></b>	-1	2	0	1
<b>A<sub>3</sub></b>	-2	1	-2	0

29. Identify the solution for the following sequencing problem when passing is not allowed:

	<b>Machine</b>				
<b>Item</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
<b>1</b>	9	7	4	5	11
<b>2</b>	8	8	6	7	12
<b>3</b>	7	6	7	8	10
<b>4</b>	10	5	5	4	8

30. There are five jobs, each of which is to be processed through 3 machines A, B and C in the order ABC. Processing times in hours are:

	<b>Machine</b>					
<b>Item</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>
<b>1</b>	8	3	7	2	5	1
<b>2</b>	3	4	5	2	1	6
<b>3</b>	8	7	6	9	10	9

Find the sequence that minimizes the total time required in performing the above jobs.

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