SAIVA BHANU KSHATRIYA COLLEGE

(Aruppukottai Nadargal Uravinmurai Pothu Abi Viruthi Trustuku Pathiyapattathu)

ARUPPUKOTTAI

QUESTION BANK

Name of the Department :	**MATHEMATICS**	UG / PG :	**UG**
Semester (UG - III & V; PG - III) :	**UG – V**	Subject Code :	**SMTJC54**
Name of the Subject :	**OPERATIONS RESEARCH**		

<u>Section A (Multiple Choice Questions)</u>

Unit I: LINEAR PROGRAMMING PROBLEM

1. Operation Research was coined by ________.
   a) M. Closky b) Church man c) Hungarian d) Kimball

2. Since $x \geq 0$, $y \geq 0$ the solution set is restricted to the _______ quadrant.
   a) first b) second c) third d) fourth

3. If the constraints of an LPP has _________ in equations of type.
   a) only $\geq$ b) only $\leq$ c) $\leq$ and $\geq$ d) $\leq$ or $\geq$ or =

4. All the decision variables are ________.
   a) positive b) negative c) non positive d) 0

5. In Simplex method the pivotal element is always _____.
   a) Positive b) Negative c) One d) Zero

Unit II: TWO-PHASE AND DUALITY

6. The number of dual variables of max $Z = x_1 + x_2 - x_3$, subject to $x_1 + x_3 \leq 5$, $5x_1 + x_2 \leq 8$, $3x_1 + 2x_2 \leq 7$; $x_1, x_2, x_3 \geq 0$ is _______
   a) 1 b) 2 c) 3 d) 4

7. The dual of the dual is __________.
   a) primal b) Two Phase c) may be primal d) none

8. A linear function $z = \sum c_j x_i$ attains its optimum solution at ________.
   a) origin b) boundary c) Vertices d) axes

9. A feasible region is _________.
   a) maximum value b) minimum value c) solution space d) solutions

10. To convert minimization problem into maximization we use
    a) max Z = - min(-Z) b) max Z = min(-Z) c) max Z = - min(Z) d) max Z = max(-Z)

Unit III: TP and AP

11. When the total demand is equal to total supply, the TP is said to be________.
    a) Minimization b) Maximization c) Unbalanced d) balanced

12. In an assignment problem the optimum table reached is

*	1	2	3	4
A	0	0	7	1
B	8	3	0	3
C	1	0	0	9
D	0	5	1	0

Then assignment B is ___________.
a) 1 b) 2 c) 3 d) 4

13. Which method is the best initial basic feasible solution?
a) NWC b) MODI c) MMM d) VAM

14. If an AP is balanced, then ________.
a) $m = n$ b) $m > n$ c) $m < n$ d) $m \neq n$

15. How many numbers of occupied cells in the TP?
a) m-n-1 b) m-n+1 c) m+n-1 d) m-n

Unit IV: GAME THEORY

16. The value of the game whose pays-off

6	-3
-3	0

matrix is _______.
a) 6 b) -3/4 c) 0 d) -3

17. A competitive situation is known as _______.
a) competition b) game c) marketing d) none.

18. Games which involve more than two players are called _________ games.
a) 2- person b) n- person c) conflicting d) negotiable

19. The saddle point of the following

5	4
3	2

game is _________.
a) 5 b) 4 c) 2 d)none

20. The size of the pay-off matrix of a game can be reduced by using the principle of _____.
a) Game inversion b) game transpose c) dominance d) logic

Unit V: SEQUENCING AND REPLACEMENT

21. If there are n jobs to be performed, one at a time, on each of m machines, the possible sequences would be ___________.
a) $n!$ b) $(n!)^m$ c) n^m d) m^n

22. In a sequencing problem, if smallest time for a job belongs to machine 1, then the job has to be placed in the ___________ of the sequence.
a) Middle b) starting c) end d) none

23. ________time to process all jobs through two machines is given by $\sum_{j=1}^{n} M_{2j} + \sum_{j=1}^{n} I_{2j}$
a) Elapsed b) Total elapsed c) processing d) idle

24. Which is not a replacement________________ in machine.
    a) failure b) break down c) good condition d)decreased efficiency

25. The problem of replacement is felt when job performing units fall____.
    a) Suddenly b) Gradually c) a or b d) none

Section B (7 mark Questions)

Unit I: LINEAR PROGRAMMING PROBLEM

26. Write a algorithm of Mathematical formulation of Linear Programming Problem.

27. Define Slack and Surplus Variables.

28. A manufactures produces two types models A and B. Each A model requires 4 hours of grinding, 2 hours of polishing and 1 hours of packing. Also B model requires 3 hours of grinding, 4 hours of polishing and 1 hours of packing. They manufacture has 2 grinders, 3 polishers and 1 packing machine. Each grinder works for 40 hours, each polisher works for 60 hours and each packing machine works for 24 hours in a week. Profit are Rs 3 and Rs 4. Formulate the Mathematical form of LPP.

29. Solve graphically method
    Min $Z = x_1 + 1.5x_2$
    Subject to the constraints:
    $-2x_1 + x_2 \leq 1$, $x_1 + x_2 \leq 3$, $x_1 \leq 2$
    $x_1, x_2 \geq 0$.

30. Use Simplex method to solve the following LPP.
    Max $Z = 2x_1 + 4x_2$
    Subject to the constraints: $x_1 + 2x_2 \leq 5$, $x_1 + x_2 \leq 4$
    $x_1, x_2 \geq 0$.

Unit II: TWO-PHASE AND DUALITY

31. Write the dual of max $Z = 2x_1 + x_2$,
    Subject to the constraints:
    $x_1 + 2x_2 \leq 10$, $x_1 + x_2 \leq 6$, $x_1 - x_2 \leq 2$, $x_1 - 2x_2 \leq 1$
    $x_1, x_2 \geq 0$.

32. Obtain the dual of the following LPP.
    min $Z = x_1 - 3x_2 - 2x_3$,
    Subject to the constraints:
    $3x_1 - x_2 + 2x_3 \leq 7$, $2x_1 - 4x_2 \geq 12$ $-4x_1 + 3x_2 + 8x_3 = 10$, $x_1 - 2x_2 \leq 1$.
    $x_1, x_2 \geq 0$ and x3 is unrestricted.

33. Write an algorithm of Dual Simplex Method.

34. Obtain the Dual Simplex of the following LPP.
min $Z = x_1 - 3x_2$
Subject to the constraints:
$3x_1 - x_2 \leq 7,\ 2x_1 - 4x_2 \geq 12,\ -4x_1 + 3x_2 \leq 10$
$x_1, x_2 \geq 0$.

35. Solve the LPP using Two- Phase method.
Min $Z = x_1 + x_2$
Subject to the constraints:
$2x_1 + x_2 \leq 1,\ x_1 + x_2 \leq 3$.
$x_1, x_2 \geq 0$.

Unit III: TP AND AP

36. Write the algorithm of NWC and Least cost Method.

37. Write the algorithm of MODI method.

38. Obtain an initial basic feasible solution to the following TP using the North West corner rule.

*	D	E	F	G	Av.
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Re.	200	225	275	250	950

39. Solve the AP

*	**1**	**2**	**3**	**4**
A	0	0	7	1
B	8	3	0	3
C	11	1	0	0
D	0	5	1	1

40. Solve the assignment problem.

160	130	175	190
135	120	130	160
140	110	125	170
50	50	80	80

Unit IV: GAME THEORY

41. Solve the game:

16	2
8	12

42. Solve the 2X3 game:

6	5	2
1	3	11

43. Solve the game using graphical method. $\begin{bmatrix} 2 & -4 & 6 \\ -3 & 4 & -4 \end{bmatrix}$

44. Explain the dominance rules in the game theory.

45. Solve the game whose pay-off matrix is given below: $\begin{bmatrix} -3 & 4 & 2 \\ 7 & 8 & 5 \\ 6 & 2 & 9 \end{bmatrix}$

Unit V: SEQUENCING AND REPLACEMENT

46. Solve the sequencing the problem.

Job	A	B	C	D	E	F
1	3	12	18	9	15	6
2	9	18	24	24	3	15

47. Solve the sequencing the problem and find idle time.

Book	1	2	3	4	5	6
Machine A	30	120	50	20	90	110
Machine B	80	100	90	60	30	10

48. Find the sequence that minimizes the total elapsed time required to complete the following job.

Job	1	2	3	4	5	6
Machine A	5	7	2	6	1	4
Machine B	2	5	4	9	1	3

49. The cost of a machine is Rs.6100 and scrap value is Rs. 100. The maintenance cost found from the experience as follows:

Year	1	2	3	4	5	6	7	8
Maintenance (Rs.)	100	250	400	600	900	1200	1600	2000

When should the machine be replaced?

50. Explain the replacement problem.

<u>Section C (10 mark Questions)</u>

Unit I: LINEAR PROGRAMMING PROBLEM

51. Solve graphical method:
    Max $Z = 5x_1 + 3x_2$
    Subject to the constraints:
    $x_1 + x_2 \leq 6$, $2x_1 + 3x_2 \geq 6$, $0 \leq x_1 \leq 4$, $0 \leq x_2 \leq 3$
    $x_1, x_2 \geq 0$.

52. Solve the LPP using Simplex method:
    Max $Z = 4x_1 + 10x_2$
    Subject to the constraints:
    $2x_1 + x_2 \leq 50$, $2x_1 + 5x_2 \leq 100$, $2x_1 + 3x_2 \leq 90$
    $x_1, x_2 \geq 0$.

Unit II: TWO-PHASE AND DUALITY

53. Obtain the dual of the following LPP. min $Z = x_1 - 3x_2 - 2x_3$,
    Subject to the constraints:
    $3x_1 - x_2 + 2x_3 \leq 7$, $2x_1 - 4x_2 \geq 12$, $-4x_1 + 3x_2 + 8x_3 = 10$, $x_1 - 2x_2 \leq 1$
    $x_1, x_2 \geq 0$ and x_3 is unrestricted.

54. Write an algorithm of Two-Phase Method.

Unit III: TP AND AP

55. Find the starting solution in the following TP by Vogel's Approximation method. Also obtain the optimum solution.

*	D	E	F	G	supply
A	3	7	6	4	3
B	2	4	3	2	2
C	4	3	8	5	3
demand	3	3	2	2	__

56. Solve the AP.

*	1	2	3	4
A	23	20	21	24
B	19	21	20	20
C	20	18	24	22
D	22	18	21	23

Unit IV: GAME THEORY

57. Solve the game:

Players B

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

58. Solve the game:

$$\begin{pmatrix} 10 & 8 & -11 & -2 \\ 14 & 6 & -5 & 5 \\ 9 & 7 & 5 & -4 \\ 15 & 4 & -3 & 3 \end{pmatrix}$$

Unit V: SEQUENCING AND REPLACEMENT

59. Solve the sequencing the problem.

Job	A	B	C	D	E	F	G
1	3	8	7	4	9	8	7
2	4	3	2	5	1	4	3
3	6	7	5	11	5	6	12

60. Explain the various assumptions involved in solving a sequencing problem.