VIJAYA COLLEGE

R V ROAD, BASAVANAGUDI, BANGALORE – 560004

COMPUTER SCIENCE - IV SEM BCA

Model paper 3

BCA 405T : OPERATION RESEARCH

Duration : 3 Hours **Max. Marks: 100**

Section A

I Answer any TEN questions **10 x 2 = 20**

1. Define OR and write any two applications of OR.
2. Write down the standard form of LPP.
3. What is pivot row and pivot column?
4. Define artificial variables with example.
5. Give the mathematical formulation of transportation problem.
6. Define slack and surplus variable.
7. Explain Fulkerson's numbering rule.
8. Define optimal solution in TP.
9. Explain the steps followed in determining the saddle point.
10. Define Maximin – Minimax principle.
11. Define Total float and Free float.
12. Explain the rule of dominance.

Section B

II Answer any FOUR questions **4 x 10 = 40**

13. a) Explain the various phases of Operation Research. **5**

b) A garment factory works in three levels i.e weaving, processing and packing with capacity to produce three different types of cloths namely suiting's, shirting's, woolens yielding the profit of Rs 2, Rs 4 and Rs 3 per meter respectively. One meter suiting requires 3 min weaving, 2 min in processing and 1 min in packing. One meter of shirting requires 4 min in weaving, 1 min in processing and 3 min in packing while one meter woolen requires 3 min in each department. In a week, total run time of each department is 60, 40 and 80 hours respectively. Formulate the linear programming problem to find the product mix to maximize the profit. **5**

14. a) Solve graphically the following LPP **6**

Max Z = 300x + 200y

Subject to $2x + y \leq 60$

$x \leq 25$, $y \leq 35$ and $x, y \geq 0$

b) Express the following LPP in the standard form **4**

Min $Z = 3x_1 + 2x_2 + x_3$

Subject to $3x_1 + 3x_2 - 5x_3 \leq 8$

$2x_1 + 6x_2 + 2x_3 \geq 5$

$x_1 - 2x_2 + 2x_3 \leq 7$ $\quad x_1 \; x_2 \; x_3 \geq 0$

15. a) Determine the Initial Basic Feasible solution for the following transportation problem. Use North – West corner rule **4**

	A	**B**	**C**	**Available**
I	2	1	3	6
II	11	4	9	5
III	10	7	4	4
IV	3	2	8	3
V	7	1	12	3
Required	9	8	4	

b) Use Vogel's approximation method to obtain an initial basic feasible solution of the given transportation problem. **6**

		To					
		P	**Q**	**R**	**S**	**T**	**Supply**
	A	2	11	10	3	7	4
From	**B**	1	4	7	2	1	8
	C	3	9	4	8	2	9
	Demand	3	3	4	5	6	

16. a) Find the Optimal Assignment Schedule for Subordinates against the jobs**.** **5**

	A	**B**	**C**	**D**
J1	8	26	17	11
J2	13	28	4	26
J3	38	19	18	15
J4	19	26	24	10

b) What do you mean by Assignment Problem? Describe the Hungarian method of solving Assignment Problem. **5**

17. The following table gives the list of activities and duration in hours **10**

Activities	1-2	1-3	1-4	2-3	3-4	2-6	3-5	5-6	6-8	5-8	4-7	5-7	7-8
Duration	4	5	3	3	4	2	6	5	7	6	4	4	8

(i) Draw an arrow diagram.
(ii) For each activity calculate early start and early finish time.
(iii) Calculate Total Float (TF) and Free Float (FF).

18. a) Solve the following game. Also find the Optimal Strategy of Player A and Player B **6**

		Player B	
		I	**II**
	I	8	-3
Player B	**II**	-3	1

b) Explain Pay Off matrix and Strategy. **4**

Section C

II Answer any FOUR questions **4 x 10 = 40**

19. a) Give the Simplex method Algorithm. **4**
b) Solve the following LPP using Simplex Method **6**

Max Z = 3x + 8y
Subject to $3x + 5y \leq 300$
$6x + 2y \leq 216$ and $x, y \geq 0$

20. Using graphical method, solve the rectangular game whose payoff matrix is **10**

		Player B			
		I	**II**	**III**	**IV**
	I	1	0	4	-1
Player B	**II**	-1	1	-2	5

21. Solve the following TP to maximize the profit using MODI method **10**

	A	**B**	**C**	**D**	**Supply**
I	15	51	42	33	23
II	80	42	26	81	44
III	90	40	66	60	33
Demand	23	31	16	30	

22. a) Solve the following Assignment Problem. **7**

	I	**II**	**III**	**IV**	**V**
A	160	130	175	190	200
B	135	120	130	160	175
C	140	110	155	170	185
D	50	50	80	80	110
E	55	35	70	80	105

b) Explain steps involved in Least-cost Method. **3**

23. The following table gives a list of jobs along with their estimates and duration in days **10**

Jobs	1-2	1-3	2-4	3-4	2-5	4-5	4-6	6-8	6-7	4-7	5-8	7-8
Optimistic t_o	1	1	2	1	2	2	3	6	5	3	4	2
Most-likely t_m	1	4	2	1	5	5	6	15	14	12	6	4
Pessimistic t_p	7	7	8	1	14	8	15	30	17	21	8	6

a) Draw the project network.
b) What is the probability that the project will be completed at least 3 days earlier than the expected ? 3 days later than expected?

24. Solve the following game , use dominance method to reduce the matrix. **10**
write the strategies adopted by each player and the value of game.

		Player B				
		Y_1	Y_2	Y_3	Y_4	Y_5
	X_1	6	15	30	21	6
Player A	X_2	3	3	6	6	4
	X_3	12	12	24	36	3