VIJAYA COLLEGE

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COMPUTER SCIENCE - IV SEM BCA

Model paper 2

BCA 405T : OPERATION RESEARCH

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

Section A

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

1. What is Operation Research.
2. What is meant by optimal solution?
3. Explain the steps involved in transportation problem.
4. Define artificial variable with example.
5. What are the different methods in solving assignment problem?
6. How to calculate critical path?
7. Explain Fulkerson's rule.
8. Define slack and surplus variable.
9. Explain the rule of determine saddle point.
10. Write any two applications of assignment problem.
11. Define Total elapsed time and idle time.
12. Explain the rule of dominance.

Section B

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

13. a) List and explain the various phases of Operation Research.   **5**

b) An agricultural research institute suggested the farmer to spread out at least 4800 kgs of special phosphate fertilizer and not less than 7200 kg of a special nitrogen fertilizer to race the productive of crops in his fields. There are two sources of obtaining these mixtures A and B. Both of these are available in bags weighing 100 kg each and they cost Rs. 40 and Rs. 24 respectively. Mixture A contains phosphate and nitrogen equivalent of 20kg and 80 kg respectively, while mixture B contains these ingredients equivalent to 50 kg each. Write this as an LPP and determine how many bags of each type the farmer should buy in order to obtain the required fertilizer at minimum cost.   **5**

14. a) Explain the steps of graphical method to obtain an optimal solution in a linear
programming problem. **4**

b) Solve graphically the following LPP **6**

  Max $Z = 10x_1 + 8x_2$
  Subject to $2x_1 + 3x_2 \leq 30$
  $x_1 - 2x_2 \geq -15$
  $x_1\ x_2 \geq 0$

15. a) Explain Hungarian method for solving assignment problem. **4**

b) Solve the transportation problem by using MODI method **6**

	I	II	III	IV	Supply
I	15	10	17	18	2
II	16	13	12	13	6
III	12	17	20	11	7
Demand	3	3	4	5	

16. a) Explain degeneracy in transportation problem. **4**

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

Destination

		D1	D2	D3	D4	Supply
	F1	3	3	4	1	100
Factroy	F2	4	2	4	2	125
	F3	1	5	3	2	75
	Demand	120	80	75	25	300

17. a) A small project consists of seven activities for which the relevant data are given below

10

Activity	Predecessor	Duration
A	--	4
B	--	7
C	--	6
D	A,B	5
E	A,B	7
F	C,D,E	6
G	C,D,E	5

(i)   Draw the network and find the project completion time.
(ii) Calculate total float for each of the activities.

18. Solve the following game using 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	4	4	2	-4	-6
Player A	X_2	8	6	8	-4	0
	X_3	10	2	4	10	12

Section C

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

19. a) Compare between assignment problem and transportation problems.   **4**

   b) Solve the following LPP using Simplex Method   **6**

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

   Subject to constraint

$$x_1 + x_2 \leq 4$$
$$x_1 - x_2 \leq 2$$
$$x_1 \ x_2 \geq 0$$

20. Use Big M Method to solve   **10**

$$\text{Minimize } Z = 4x_1 + 3x_2$$

   Subject to constraint

$$2x_1 + x_2 \geq 10$$
$$-3x_1 + 2x_2 \leq 6$$
$$x_1 + x_2 \geq 6$$
$$x_1, x_2 \geq 0$$

21. a) Luminus camps has three factories F1,F2,F3 with production capacity 30,50 and 20 units per week respectively. These units are to be shipped to four warehouses W1, W2, W3 and W4 with requirements 20, 40, 30 and 10 units per week respectively. The transportation costs (in Rs.) per unit between factories and warehouses are given below

Warehouse

		W1	W2	W3	W4	Supply
	F1	1	2	1	4	30
Factory	F2	3	3	2	1	50
	F3	4	2	5	9	20
	Demand	20	40	30	10	

Find the initial basic feasible solution of the given transportation problem using North West corner rule. **5**

b) Give mathematical formulation of a transportation problem. **5**

22. a) Mention the types of assignment problem. Describe the methods of an assignment problem. **5**

b) solve the assignment problem given below: **5**

	A	B	C	D
I	1	4	6	3
II	9	7	10	9
III	4	5	11	7
IV	8	7	8	5

23. a) Write differences between PERT and CPM **4**

b) Calculate the earliest start , earliest finish, least start, least finish of each activity of the project given below: **6**

Activites	1-2	1-3	2-4	2-5	3-4	4-5
Duration (in days)	8	4	10	2	5	3

24. a) Explain the following terms : **6**

i)   payoff matrix

ii)   Fair game

iii)   Strategy

b) Solve the following game whose payoff matrix is given below **4**

$$\begin{vmatrix} 9 & 3 & 1 & 8 & 0 \\ 6 & 5 & 4 & 6 & 7 \\ 2 & 4 & 3 & 3 & 8 \\ 5 & 6 & 2 & 2 & 1 \end{vmatrix}$$