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Reg. No. :

Code No. : 6054

Sub. Code : C 2 AM

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2011.

Second Semester

Mathematics — Main

Optional II — OPERATIONS RESEARCH

(For those who joined in July 2008 and afterwards)

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

1. State that standard form of LPP.
2. Convert maximization into minimization.
3. Write the note on cycling.
4. Supply : $a_1 = 10, a_2 = 5, a_3 = 4, a_4 = 6$
Demand $b_1 = 10, b_2 = 5, b_3 = 7, b_4 = 7$
Determine whether a dummy source or a dummy destination must be added to balance the model.

5. Write down the methods to find the starting basic solution of the transportation problem.
6. State any two network optimization algorithm.
7. Define a connected network.
8. Write the conditions for an activity (i, j) to be critical.
9. $TF = 10, FF = 0, D = 4$. Determine the maximum delay in the starting time.
10. Define the mixed cut.

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Express the following LP model in standard form Maximize $z = 2x_1 + 3x_2 + 5x_3$ subject to
 $x_1 + x_2 - x_3 \geq -5, -6x_1 + 7x_2 + 9x_3 \leq 4,$
 $x_1 + x_2 + 4x_3 = 10; x_1, x_2 \geq 0, x_3$ unrestricted.

Or

- (b) Show how the following objective function can be presented in the standard LP form Minimize
 $z = \text{Max} \{1x_1 - x_2 + 3x_3, 1 - x_1 + 3x_2 - x_3\}$
 $x_1, x_2, x_3 \geq 0.$

12. (a) Describe the Northwest – corner method.

Or

- (b) Give the simplex method Explanation of the method of multipliers.

13. (a) Write the Floyd's algorithm.

Or

- (b) Write the Dijkstra's algorithm.

14. (a) Explain the method for constructing a time schedule.

Or

- (b) Explain Red-Flagging Rule.

15. (a) Write the Branch-Bound algorithm.

Or

- (b) Write the cutting plane algorithm.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Determine the optimum solution for the following LP by enumerating all the basic solutions Maximize

$$z = 2x_1 + 4x_2 + 5x_3 - 64x_4$$

$$\text{subject to } x_1 + 4x_2 - 2x_3 + 8x_4 \leq 2,$$

$$-x_1 + 2x_2 + 3x_3 + 4x_4 \leq 1, x_1, x_2, x_3, x_4 \geq 0.$$

Or

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- (b) Using simplex method solve the following LP :
Maximize $z = 5x_1 + 4x_2$ subject to
 $6x_1 + 4x_2 \leq 24; x_1 + 2x_2 \leq 6, -x_1 + x_2 \leq 1,$
 $x_2 \leq 2, x_1, x_2 \geq 0.$

17. (a) Determine the optimal solution to the transportation model.

5	1	7	10
6	4	6	80
3	2	5	15
75	20	50	

Or

- (b) Solve the assignment model

3	9	2	3	7
6	1	5	6	6
9	4	7	10	3
2	5	4	2	1
9	6	2	4	5

18. (a) A hiker has a 5 – ft³ backpack and needs to decide on the most valuable items to take on the hiking trip. These are three items from which to choose. Their volumes are 2, 3 and 4 ft³ and the hiker estimates their associated values on a scale from 0 to 100 as 30, 50 and 70 respectively. Express the problem as longest route network and find the optional solution.

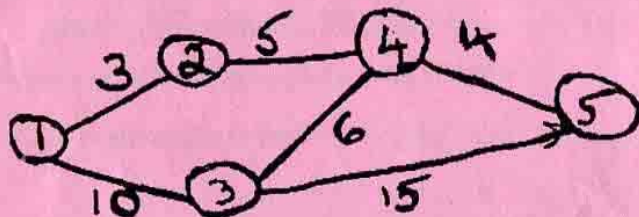
Or

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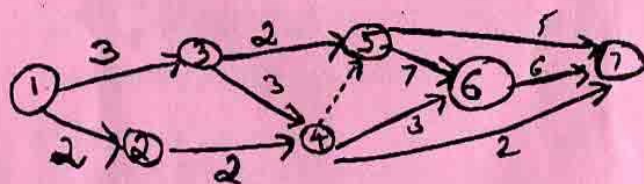
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[P.T.O.]

- (b) For the network given below, find the shortest routes between every two nodes. The distances (in miles) are given on the arcs. Arc (3, 5) is directional so that no traffic is allowed from node 5 to node 3. All the other arcs allow traffic in both directions.



19. (a) Determine the critical path for following project net work.



Or

- (b) Draw the network for the data and compute the critical path.

Activity	: A	B	C	D	E
Predecessor	: -	-	-	A	B
Time	: 3	5	4	2	3

Activity	: F	G	H	I
Predecessor	: C	D,E	B	H,F
Time	: 9	8	7	9

20. (a) Solve the following by B and B Maximize $z = 18x_1 + 14x_2 + 8x_3 + 4x_4$ subject to $15x_1 + 12x_2 + 7x_3 + 4x_4 + x_5 \leq 37$, $x_1, x_2, x_3, x_4, x_5 = (0,1)$.

Or

- (b) Solve the following by cutting plane algorithm :

$$\text{Maximize } z = 17x_1 + 10x_2$$

$$\text{Subject to } -x_1 + 3x_2 \leq 6;$$

$$7x_1 + x_2 \leq 35; x_1, x_2 \geq 0 \text{ and integer.}$$