LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **MATHEMATICS**

FIFTH SEMESTER – **NOVEMBER 2019**

MT 5507 – OPERATIONS RESEARCH

Date: 31-10-2019 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART – A

Answer ALL questions **(10 x 2 = 20)**

1. Define optimal feasible solution in a linear programming problem.
2. Define slack variable in a linear programming problem.
3. What is a transportation problem?
4. Define degeneracy in transportation problem
5. What is an unbalanced assignment problem?
6. Define Payoff matrix.
7. What is the maxi-min principle in game theory?
8. Define a path, cycle and tree in a network.
9. Write any two differences between CPM and PERT.
10. What is Economic Order Quantity?

PART – B

Answer any FIVE questions **(5 x 8 = 40)**

11. Use the graphical method to solve the following linear programming problem.

Minimize $Z = 5x_1 + 4x_2$ subject to the constraints

$$x_1 - 2x_2 \leq 1$$
$$x_1 + 2x_2 \geq 3$$
$$\text{and} \quad x_1, x_2 \geq 0.$$

12. Use the simplex method to solve the following linear programming problem.

Maximize $Z = 5x_1 + 3x_2$ subject to the constraints

$$x_1 + x_2 \leq 2$$
$$5x_1 + 2x_2 \leq 10$$
$$3x_1 + 8x_2 \leq 12$$
$$\text{and} \quad x_1, x_2 \geq 0.$$

13. Determine an initial feasible solution to the following transportation problem by North West Corner method and Least cost method.

		Destination				
						Supply
Origin		2	3	5	1	7
		7	3	4	6	9
		14	1	7	2	18
Demand		4	8	7	15	

14. Solve the following assignment problem.

Persons

Jobs	P_1	P_2	P_3	P_4
J_1	5	26	13	15
J_2	3	9	18	3
J_3	10	7	3	2
J_4	5	11	9	7

15. Solve the following game using graphical method.

	Player B	
Player A	1	−3
	3	5
	−1	6
	4	1
	2	2
	−5	0

16. Solve the following game using dominance principle.

	Player B			
Player A	3	2	4	0
	3	4	2	4
	4	2	4	0
	0	4	0	8

17. Discus the shortest route problem.

18. A manufacturer has to supply his customer with 600 units of his product per year. Shortages are not allowed and the storage cost amounts to Rs.60 per unit per year. The set-up cost per run is Rs.80.00. Find the optimum run size and the minimum average yearly cost.

PART – C

Answer any TWO questions **(2 x 20 = 40)**

19. Solve the following linear programming problem by big-M method.

$$\text{Maximize } Z = x_1 + 2x_2$$

subject to the constraints $x_1 - x_2 \geq 3$

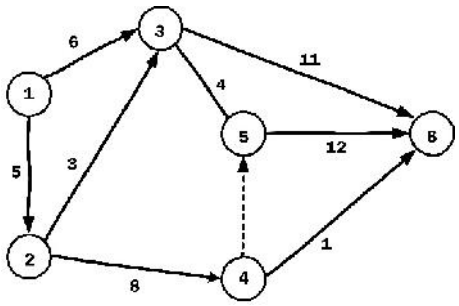
$2x_1 + x_2 \leq 10$

and $x_1, x_2 \geq 0.$

20. (a). Draw the network for the project whose activity and precedence relationships are given below.

Activity	A	B	C	D	E	F	G	H	I	J
Predecessor	–	-	-	–	A, B	E	F	D	G, H	C, I

(b). Determine critical path for the network given below (All the durations are given in days).



(6+14)

21. Find the optimal transportation cost of the following transportation by using MODI method.

		Destination				
		D_1	D_2	D_3	D_4	Supply
Source	S_1	19	30	50	10	7
	S_2	70	30	40	60	9
	S_3	40	8	70	20	18
Demand		5	8	7	14	

22. (a). A commodity is to be supplied at a constant rate of 200 units per day. Supplies of any amount can be had at any required time, but each ordering costs Rs.50; cost of holding the commodity in inventory is Rs. 2.00 per unit per day while the delay in the supply of the item induces a penalty of Rs.10 per unit day. Find the optimal policy (q,t), where t is the reorder cycle period and q is the inventory level after reorder.

(b). The annual demand of a product is 10,000 units. Each unit costs Rs.100 if orders placed in quantities below 200 units but for orders of 200 or above the price is Rs. 95. The annual inventory holding cost is 10 percent of the value of the item and the ordering cost is Rs. 5 per order. Find the economic lot size.

(12+8)

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