LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **COMPUTER SCIENCE**

FIFTH SEMESTER – NOVEMBER 2016

CS 5402 - OPERATIONS RESEARCH

Date: 09-11-2016 Dept. No. Max. : 100 Marks
Time: 09:00-12:00

PART-A

Answer ALL questions **10 X 2=20**

1. Write a General form of LPP.
2. What are the limitations of applying Graphical method to solve a L.P.P?
3. Why dual methods is preferred to solve LPP.
4. Define traveling salesman problem.
5. List out the methods of solving Transportation problem.
6. Define Activity & Node
7. What is a sequencing problem?
8. Define ideal time in sequencing problem.
9. What is inventory?
10. Give an example for setup cost and carrying cost.

PART-B

Answer All questions **5 X 8=40**

11 a)) A Company produces refrigerators in unit I and heaters in unit II. The two products are produced and sold in a weekly basis. Weekly production cannot exceed 25 in unit I and 36 in unit II. Formulate this problem as an LP model

(OR)

11 b Solve the following L.P.P graphically.

Minimize $Z = 5x_1 + 2x_2$

Subject to $3x_1 + x_2 \geq 3$

$3x_1 - 2x_2 \leq 6$

$x_1 + x_2 \leq 4$

$x_1, x_2 \geq 0$

12 a) Construct the dual to the primal problem

Minimum $Z = x_1 + x_2 + x_3$

Subject to $x_1 - 3x_2 + 4x_3 = 5$

$x_1 - 2x_2 \leq 3$

$2x_2 - x_3 \geq 4$

$x_1, x_2 \geq 0$ x_3 unrestricted in sign.

(OR)

12 b) Obtain the initial solution of the following transportation problem using the **north-west corner rule and matrix minima** given that (i) the requirements are 40, 90 and 100 units and (ii) the supply are 90, 70 and 70.

	Source		
Destination	**S1**	**S2**	**S3**
D1	15	28	27
D2	24	24	25
D3	22	25	20

13 a) A marketing manager has 5 salesmen and 5 sales districts. Considering the capabilities of the salesman and the nature of districts, the marketing manager estimates that sales per month (in hundred rupees) for each salesman in each district would be as follows:

Salesman	Sales District				
	A	B	C	D	E
1	32	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

What is the maximum sale that may be expected if an optimum assignment is made?

(OR)

13 b) Find the sequence that minimizes the total elapsed time required to complete the following tasks on two machines

Task	: A	B	C	D	E	F	G	H	I
Machine I	: 2	5	4	9	6	8	7	5	4
Machine II	: 6	8	7	4	3	9	3	8	11

14 a) A project consists of a series of activities called A,B,..,I with the following relationship W <X,Y means X and Y cannot start until W is completed with this notation construct a network diagram having the following constraints.

A<D,E; B,D<F; C<G; B<H; F,G<I;

Time:	A	B	C	D	E	F	G	H	I
Activity:	23	8	20	16	24	18	19	4	10

(OR)

14 b) (i) state the difference between PERT & CPM. **(4)**

(ii) Define the following terms:

a)dummy activity b) total float (4) .

15a) Manufacture has to supply 600 units of his product/year. Shortages are not allowed and storage cost amounts to Rs.0.60/unit/year.The set up cost/run is Rs.80.Determine(i) optimum run size (ii) the minimum average yearly cost.

(OR)

15 b) The annual demand for an item is 3200 units. The unit cost is Rs. 6/- and inventory carrying charges 25% per annum. If the cost of one procurement is Rs. 150/- determine *(i)* Economic order quality *(ii)* time between two consecutive orders *(iii)* number of order per year *(iv)* the optimal total cost

PART-C

Answer any TWO **2 X 20=40**

16 a) Use simplex method to solve the following L.P.P

$$\text{Maximize } Z = x_1 + 2x_2 + x_3$$
$$\text{Subject to } 2x_1 + x_2 - x_3 \leq 2$$
$$-2x_1 + x_2 - 5x_3 \geq -6$$
$$4x_1 + x_2 + x_3 \leq 6$$
$$x_1, x_2, x_3 \geq 0$$

b) Determine an initial basic feasible solution to the following transportation problem by using (a) Least cost method(b)Vogel's approximation.

Destination						
Source		D1	D2	D3	D4	Supply
	S1	21	16	15	3	11
	S2	17	18	14	23	13
	S3	32	27	18	41	19
	Demand	6	10	12	15	

17 a) Find the sequence that minimizes the total time required in performing the following job on three machines in order ABC .A processing time of all jobs(in hours) are given in the following table.

Jobs	:1	2	3	4	5
Machine A	:8	10	6	7	11
Machine B	:5	6	2	3	4
Machine C	:4	9	8	6	5

b) The project has the following time schedules.

Activity	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
t_0	3	2	6	2	5	3	3	1	4
t_m	6	5	12	5	11	6	9	4	19
t_p	15	14	30	8	17	15	27	7	28

i) Draw the Project Network
ii) Find the critical path.

18 a) A stockiest has to supply 12,000 units of a product per year to his customer. The demand is fixed and known and the shortage cost is assumed is to be infinite. The inventory holding cost is Re.0.20 per unit per month and the ordering cost per order is Rs.350. Determine the following

(i) The optimum lot size q_0
(ii) Optimum scheduling period t_0
(iii) Minimum total variable yearly cost.

b) The demand of an item is uniform at the rate of 20 units/month. The fixed cost is Rs.10 each time the production run is made. The production cost is Re 1/item and the inventory carrying cost is Rs.0.25/month/item. If the shortage cost is Rs.1.25/item/month. Determine how often to make a production run and at a what size it should?

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