LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – **APRIL 2014**

CS 5402 - OPERATIONS RESEARCH

Date : 15/04/2014   Dept. No.   Max. : 100 Marks
Time : 09:00-12:00

PART-A

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

1. What is mathematical formulation?

2. Mention the disadvantages of obtaining solution using graphical method.

3. What is optimal solution?

4. List out the methods of solving Transportation problem.

5. Define traveling salesman problem.

6. How to check optimality in assignment problem?

7. Define Activity &Dummy activity.

8. What is a sequencing problem?

9. What is Holding Cost?

10. What is reordering level

PART-B

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

11 a) Discuss the scope of OR.

(OR)

11 b) 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

12 a) Solve the following l.p.p graphically.

$$\text{Max } Z = 10 x_1 + 15x_2$$

Subject to
$$2 x_1 + x_2 \leq 26$$
$$2 x_1 + 4x_2 \leq 56$$
$$- x_1 + x_2 \leq 5$$
$$x_1, x_2 \geq 0$$

12 b) (i) Write the rules for converting primal into dual of a L.P.P problem.

   (ii) Construct the dual to the primal problem

$$\text{Max } Z = 3x_1 + 5x_2$$

Subject to

$$2x_1 + 6x_2 \leq 50$$
$$3x_1 + 2x_2 \leq 35$$
$$5x_1 - 3x_2 \leq 10$$
$$x_2 \leq 20$$
$$x_1, x_2 \geq 0$$

13a) Obtain the initial solution of the following transportation problem by the north-west corner rule 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

(OR)

13 b) A department has five employees with five jobs to be performed. From past records, the time (in hours) that each man take to do each job is known and given in the table

		Employee				
		I	II	III	IV	V
	A	10	5	13	15	16
	B	3	9	18	13	6
Jobs	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

How should the jobs be allotted on per employee, so as to minimize the total number of hours.

14 a)(i) Write the procedure to find the optimal sequence

   (ii) 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

(OR)

14 b) Construct the network and find the critical path and minimum time to complete the project for the following task.

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

Task	: A	B	C	D	E	F	G	H	I
Time (days)	: 8	10	8	10	16	17	18	14	9

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15a) (i)Define Inventory.

(ii) 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.Find the optimum run size and the minimum average yearly cost.

(OR)

15 b) (i)What is Lead time.

(ii)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.

PART-C

Answer any TWO 2 X 20=40

16 a) Use Simplex method to solve the following l.p.p

Max $Z = 5 x_1 + 3x_2$

Subject to $x_1 + x_2 \leq 2$

$5 x_1 + 2x_2 \leq 10$

$3x_1 + 8x_2 \leq 12$

$x_1, x_2 \geq 0$

(b) b) The transportation costs of items per unit manufactured by Glass Company from four different locations to four different warehouses are given below. Find the allocation of items from locations to warehouses in order to minimize the transportation cost.

		Locations of Company				Requirement
		L1	L2	L3	L4	
Warehouses	**W1**	20	36	10	28	**10**
	W2	40	20	45	20	**4**
	W3	75	35	45	50	**6**
	W4	30	35	40	25	**5**
	Availability	**13**	**10**	**6**	**6**	

17 a)) i) What is an Idle time.

(ii) Find the sequence that minimizes the total time required in performing the following job on three machines in order ABC .A processing time (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(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) (i)A company uses annually 24,000 units of raw material which costs Rs1.25/unit placing each order cost Rs.22.50 and the carrying cost is 5.4%/year of the average inventory. Find the total cost including the cost of material.

(ii) The demand of an item is uniform at the rate 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?

    b) i) The daily demand for a commodities 100 units Every time an order is places a fixed cost of Rs.400 is incurred. The daily holding cost/unit inventory is Rs.0.08.If the lead-time is 13 days, determine the E.O.Q and reorder point.

    (ii) The production department for a company requires3600kg of raw material for manufacturing a particular item per year. It has been estimated that the cost of placing an order is Rs.36 and the cost carrying inventory is 25% of the investment in the inventories. The price is Rs. 10 per kg. The purchase manager wishes to determine an ordering policy for raw material.