LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – COMPUTER SCIENCE

FIFTH SEMESTER – NOVEMBER 2011

CS 5402 - OPERATIONS RESEARCH

Date : 08-11-2011   Dept. No.   Max. : 100 Marks
Time : 9:00 - 12:00

PART-A

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

1. Write the steps involved in L.P model formulation.

2. Define optimum basic feasible solution.

3. Mention the use of slack variables.

4. Define traveling salesman problem.

5. List out the methods of solving Transportation problem.

6. How to check optimality in assignment problem?

7. Define Activity & Node

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) A Company sells two different products A, and B making a profit of Rs40 and Rs30 per unit on them, respectively. They are produced in a common production process and are sold in two different markets. The production process has a total capacity of 30,000 man-hours. It takes three hours to produce a unit of A and one hour to produce a unit of B .The market has been surveyed and company officials feel that the maximum number of units of A that can be sold is 8000 units and that of B is 12000 units. Subject to these limitations product can be sold in any combination. Formulate this problem as an LP model to maximize profit.

(OR)

b) Solve the following l.p.p graphically.

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

Subject to $\quad 2 x_1 + x_2 \leq 26$

$\quad\quad\quad\quad\quad 2 x_1 + 4x_2 \leq 56$

$\quad\quad\quad\quad - x_1 + x_2 \leq 5$

$\quad\quad\quad\quad\quad\quad x_1, x_2 \geq 0$

12 a) (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

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

(OR)

b) Find an initial allocation by Vogel's approximation method for the following transportation problem whose cost matrix availability at each plant and requirements at each warehouse are given as follows

Warehouse→ Plant ↓	W1	W2	W3	W4	Availability
P1	48	60	56	58	140
P2	45	55	53	60	260
P3	50	65	60	62	360
P4	52	64	55	61	220
P5	200	320	250	210	

13 a) (i) Write the step by step procedure of Hungarian method to solve assignment problem.

(ii)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
Jobs	B	3	9	18	13	6
	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

(OR)

b)(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

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

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)

b) (i)Write about different cost in PERT method .

(ii) Write the Fulkerson' rule to numbering in network.

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)

b) (i)What is Lead time.

(ii)The daily demand for a commodities 100 units Every time an order is places a fixed cost of Rs.100 is incurred. The daily holding cost/unit inventory is Rs.0.02.If the lead-time is 12 days, determine the E.O.Q and reorder point.

PART-C

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

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

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

Subject to

$$x_1 + x_2 \le 2$$
$$5 x_1 + 2x_2 \le 10$$
$$3x_1 + 8x_2 \le 12$$
$$x_1, x_2 \ge 0$$

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

Destination						
		D1	D2	D3	D4	Supply
Source	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) 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) A project consists of a series of activities called A,B,….I with following constraints

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

The project has the following time schedules.

Task :	A	B	C	D	E	F	G	H	I
Optimistic time:	5	18	26	16	15	6	7	7	3
Pessimistic time:	10	22	40	20	25	12	12	9	5
Most likely time:	8	20	33	18	20	9	10	8	4

Draw the network diagram of activities and determine 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.

****