LOYOLA COLLEGE (AUTONOMOUS) CHENNAI-600034

M.Sc. DEGREE EXAMINATION- MATHEMATICS

THIRD SEMESTER- NOVEMBER 2014

MT 3813 – OPERATIONS RESEARCH

Date: Max: 100

Set-II

Answer ALL the questions

All questions carry equal marks

I a) Explain cutting plane method of solving an integer programming. (5)

(or)

b) Write the concept of dynamic programming. Mention some of the applications.

c) Solve the LPP using Branch and Bound Technique

Maximize $Z = 7x_1 + 9x_2$

Subject to

$-x_1 + 3x_2 \le 6$

$7x_1 + x_2 \le 35 \quad x_1, x_2 \ge 0$ and integers.

(or)

d) (i) Mention the salient features of dynamic programming technique. State Bellman's principle of optimality. (5+10)

(ii) Find the shortest route for traveling from city 1 to city 10 using dynamic programming technique.

	2	3	4
1	8	11	9

	5	6	7
2	12	14	17
3	19	16	15
4	13	12	14

	8	9
5	6	7
6	5	8
7	9	6

	10
8	11
9	12

II a) Explain any three of the factors affecting inventory control.

(or)

b) Explain Just In Time Inventory Model. (5)

c) (i) A company has a demand of 5,000 units of a product per year and cost of one unit is Rs.20. The company estimates that it costs Rs.200 to place an order. The holding cost of one unit is 10% of unit price per year. Determine the optimum order quantity, frequency of order and the total cost per year.

(ii) The probability distribution of a certain food item sales per day is as follows.

Demands	23	24	25	26	27	28	29	30	31	32
Probability	.01	.03	.06	.10	.20	.25	.15	.10	.05	.05

The cost of a pack is Rs.260 and it is sold at the cost Rs.360. Unsold items could not be returned. Determine the optimum order quantity. (10+5)

(or)

d) Following information is known about a group of items. Classify the materials into an ABC classification. Also explain with graph.

Item Name	Units	Unit cost in Rs.
P1	200	10
P2	600	25
P3	150	36
P4	25	16
P5	80	20
P6	200	80
P7	300	12
P8	800	15
P9	60	40
P10	110	30

III a) Explain Kendall's notation for representing queuing models. (5)

(or)

b) What is a queueing theory? What are the limitations of queueing theory?

c) In a refinery, oil tankers trucks arrive at a rate of 24 per day. Assuming that the inter arrival time follows an exponential distribution and the time taken to fill oil is also exponential with an average 32 minutes. Calculate the following

(1) The mean queue size
(2) If the input of trucks increases to an average 30 per day, what will be change in (1)
(3) The expected waiting time in the queue.
(4) The average number of trucks in the system.

(or)

d) With usual notation show that the probability distribution of queue length p_n is given by $p_n = \rho^n(1-\rho)$ where $\rho = \dfrac{\lambda}{\mu} < 1, n \geq 0$. (15)

IV) a) Identify the major difference between linear programming and goal programming.

(or)

b) What is sensitivity analysis? (5)

c) (i) Explain (a) deviational variable (b) pre-emptive prority factors (c) cardinal value and ordinal value

(ii) A company manufactures two types of products P1 and P2. Each 200 unit of P1 requires 20 man-hour of labour while each 200 units of P2 requires 30 hours of man- hour labour. It is assumed that only 80 man-hour of labour are available each week. Both the products produce a profit of Rs.20 per unit. The management has the following priorities.

P_1:The company has the desire to achieve the profit of Rs. 50000 per week from these two products.

P_2: Sell at least 1400 unit of P2.

P_3: Sell at least 1200 unit of P1.

Formulate the problem as goal programming and illustrate with graph. (3+12)

(or)

d) Solve the following Linear Programming Problem

Maximize $Z = 2x_1 + x_2$

$$3x_1 + 4x_2 \leq 6$$

$$6x_1 + 2_2 \leq 3 \text{ where } x_1, x_2 \geq 0$$

How much the first resource could be increased and decreased to achieve the best marginal increase in the value of the objective function?

V) a) State the necessary and sufficient conditions of Kuhn-Tucker to solve quadratic programming problem. (5)

(or)

b) Compare Lagrangian, Kuhn-Tucker and Wolfe's methods of solving quadratic programming problem.

c) Using Kuhn-Tucker conditions solve the non-linear programming problem

Maximize $z = x_1^2 + x_2^2 + 60x_1$

subject to $x_1 \geq 80$ (15)

$$x_1 + x_2 \geq 120 \text{ where } x_1, x_2 \geq 0$$

(or)

d) Determine the maxima or minima of the function $f = x^2 + y^2 + z^2$ if $x + 2y + 2z = 3$ using Lagrangian Multipliers.

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