15281

B. Tech 7th Semester Examination

Operations Research (NS)

ME-415

Time : 3 Hours   **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : This question paper carries five sections. Attempt any five questions selecting atleast one question each from section A, B, C & D. Section E is compulsory.

SECTION - A

1. (a) What is an appropriate objective criterion for evaluating the alternatives?   (8)

    (b) In a baseball game, Jim is the pitcher and Joe is the batter. Suppose that Jim can throw either a fast or a curve ball at random. If Joe correctly predicts a curve ball, he can maintain a 500 batting average, else if Jim throws a curve ball and Joe prepares for a fast ball, his batting average is kept down to 200. On the other hand, if Joe correctly predicts a fast ball, he gets a 300 batting average; else his batting average is only 100. (a) Define the alternatives for this situation, (b) Define the objective function for the problem and discuss how it differs from the familiar optimization (maximization or minimization) of a criterion.
                                                              (12)

2. (a) Define operation research. Give features of O.R. Briefly discuss techniques and tools of O.R.   (10)

    (b) Explain approximations in O.R. models. What are advantages and characteristics of a good model?   (10)

[P.T.O.]

SECTION - B

3. (a) Discuss in detail the role of linear programming in managerial decision-making, bringing out limitations if any.
                                                              (8)

    (b) Food X contains 6 units of vitamin A per gram and 7 units of vitamin B per gram and costs 12 paise per gram. Food Y contains 8 units of vitamin A per gram and 12 units of vitamin B per gram and costs 20 paise per gram. The daily minimum requirement of Vitamin A and Vitamin B is 100 units and 120 units respectively. Find the minimum cost of product mix by the simplex method.   (12)

4. A manufacturer of cylindrical containers receives tin sheets in widths of 30 cm and 60 cm respectively. For these containers the sheets are to be cut to three different widths of 15 cm, 21 cm and 27 cm respectively. The numbers of containers to be manufactured from these three widths are 400, 200 and 300 respectively. The bottom plates and top covers of the containers are purchased directly from the market. There is no limit on the lengths of standard tin sheets. Formulate the L.P. model for the production schedule that minimizes the trim losses.
                                                              (20)

SECTION - C

5. A salesman wants to visit cities A, B, C, D and E. He does not want to visit any city twice before completing his tour of all the cities and wishes to return to the point of staring journey. Cost of going from one city to another (in rupees) is given in table below. Find the least cost route.

	A	B	C	D	E
A	0	2	5	7	1
B	6	0	3	8	2
C	8	7	0	4	7
D	12	4	6	0	5
E	1	3	2	8	0

                                                              (20)

6. (a) A company manufacturing air coolers has two plants located at Mumbai and Kolkota with a capacity of 200 units and 100 units per week respectively. The company supplies the air coolers to its four show rooms situated at Ranchi, Delhi, Lucknow and Kanpur which have a maximum demand of 75, 100, 100 and 30 units respectively. Due to the differences in raw material cost and transportation cost, the profit per unit in rupees differ which is shown in the table below.

	Ranchi	Delhi	Lucknow	Kanpur
Mumbai	90	90	100	110
Kolkata	50	70	130	85

Plan the production programme so as to maximize the profit. The company may have its production capacity at both plants partly or wholly unused. (12)

(b) What is travelling salesman problem? What is the current status of the solvability of the travelling salesman problem? What are the problems being faced in the research? (8)

SECTION - D

7. (a) A project schedule has the following characteristics:

Activity	Time (weeks)	Activity	Times (weeks)
1-2	4	5-6	4
1-3	1	5-7	8
2-4	1	6-8	1
3-4	1	7-8	2
3-5	6	8-10	5
4-9	5	9-10	7

(i) Construct the network, (ii) Compute E and L for each event, and (iii) Find the critical path. (14)

(b) What do you mean by slack? Define critical path in the light of the definition of slack. (6)

[P.T.O.]

8. The optimistic, most likely and pessimistic times of the activities of a project are given below. Activity 40-50 must not start before 22 days, while activity 70-90 must end by 35 days. The scheduled completion time of the project is 46 days. Draw the network and determine the critical path. What is the probability of completing the project in scheduled time? (20)

Activity	t_0-t_m-t_p	Activity	t_0-t_m-t_p
10-20	4-8-12	50-70	3-6-9
20-30	1-4-7	50-80	4-6-8
20-40	8-12-16	60-100	4-6-8
30-50	3-5-7	70-90	4-8-12
40-50	0-0-0	80-90	2-5-8
40-60	3-6-9	90-100	4-10-16

SECTION - E (Compulsory Question)

9. Write short answers of the following:

(a) What are the situations where OR techniques will be applicable?

(b) Where is the optimal solution of an L.P.P. located on a graph?

(c) Suggest the suitable model for the following: (i) Flow process chart in an organisation, (ii) motion film.

(d) What is pseudo-optimal solution?

(e) What is the role of surplus variables in the simplex method?

(f) Explain the steps involved in V.A.M.

(g) Explain the Hungarian method.

(h) What is the optimality criterion in the assignment problem?

(i) Explain forward and backward planning.

(j) Compare and contrast CPM and PERT models.

(2×10=20)