Exam.Code:0944
Sub. Code: 7080

1108

B.E. (Mechanical Engineering)
Eighth Semester
MEC-802: Operation Research

Time allowed: 3 Hours **Max. Marks: 50**

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section.

x-x-x

Q1. (a) What are the main components of an OR model? (2*5=10)

(b) What is the difference between slack and surplus variable?

(c) What is balking in queuing theory?

(d) How would you deal with the assignment problems, where the objective function is to be maximized?

(e) What do you understand by queue discipline?

Section A

Q2. (a) An advertising company wishes to plan an advertising campaign in three different media – Television, Radio, and Magazines. The purpose of the advertising program is to reach as many potential customers as possible. Result of a market study are given below: (5)

	Television	Radio	Magazine I	Magazine II
Cost of an advertising unit (in Rs)	30,000	20,000	15,000	10,000
No. of potential customers reached per unit	20,000	6,00,000	1,50,000	1,00,000
No. of female customers reached per unit	1,50,000	4,00,000	70,000	50,000

The company does not want to spend more than ₹ 4,50,000 on advertising. The following are further requirements:

(1) at least 1 million exposures take place among female customers;

(2) advertising on magazines be limited to ₹ 1,50,000;

(3) at least 3 advertising units be bought on magazine I and 2 units on magazine II;

(4) number of advertising units on radio and television should each be between 5 and 10.

Formulate the LP model for the problem.

(b) Discuss the methodology of operation research. (5)

Q3. Solve the following LPP: (10)

$$\text{Maximize} \quad Z = 3x_1 + 5x_2$$
$$\text{subject to} \quad x_1 - 2x_2 \le 6,$$
$$x_1 \le 10,$$
$$x_2 \ge 1,$$
$$\text{and} \quad x_1 \ge 0,\ x_2 \ge 0$$

P.T.O.

Q4. Use dual simplex method to solve the following LP problem: (10)

$$\begin{aligned} \text{Minimize} \quad & Z = 3x_1 + 2x_2 + x_3 \\ \text{subject to} \quad & 3x_1 + x_2 + x_3 \geq 3, \\ & -3x_1 + 3x_2 + x_3 \geq 6, \\ & x_1 + x_2 + x_3 \leq 3 \\ \text{and} \quad & x_1, x_2, x_3 \geq 0 \end{aligned}$$

Section B

Q5. Consider the transportation problem presented in Table 1. (10)

	D_1	D_2	D_3	D_4	Supply
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	34

Table 1. Transportation cost table

a) Write down the mathematical model for the given problem.

b) Determine an initial feasible solution using following methods (i) NWCR (ii) LCM (iii) VAM.

Q6. A travelling salesman has to visit 5 cities. He does not want to visit any city twice before completing the tour of all the cities and wishes to return to his home city, the starting station. The travelling cost (in thousands of Rupees) of each city from a particular city is given below. Find the least cost route. (10)

		To city				
		1	2	3	4	5
From city	1	---	2	5	7	1
	2	6	---	3	8	2
	3	8	7	---	4	7
	4	12	4	6	---	5
	5	1	3	2	8	---

Q7. (a) Explain the basic elements of a queuing system. (5)

(b) A project has following time schedule. (5)

Activity (i-j)	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-9	8-10	9-10
Duration (in weeks)	4	1	1	1	6	5	4	8	1	2	1	8	7

Draw the network, identify critical path and compute total float for each activity.

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