

8m

INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR

Date of Examination:.....-02-2016, FN/AN, Time: 2 Hours, Full Marks: 30

Mid-Spring Semester 2016, Department of Mathematics, Branch: All

Subject No.:MA30014, Subject Name: Operations Research

Number of Students: 106, Instructions: Answer all the questions(6x5=30M).

Q1. A 24-hour super market has the following minimal requirement for salespersons. Period (I+1) follows immediately after period I. A salesperson works eight consecutive hours in a day. He can join in the beginning of any one of the six periods which fulfills eight consecutive hours work in a day. Formulate an integer programming model for a daily salesperson worksheet which satisfies the requirement with least number of personnel. State an optimal solution of the formulated model.

Period in a Day	1	2	3	4	5	6
24 Hour Clock	6--10	10--14	14--18	18--22	22--02	02--6
Minimum No.	6	10	12	8	5	4

Q2. Solve the LPP by Simplex method(use condensed Tableau):

$$\text{Max: } Z = 3x_1 + 4x_2 + 2x_3$$

$$\text{Subject to } x_1 + 2x_2 + 3x_3 \leq 90$$

$$3x_1 + x_2 + 2x_3 \leq 100, x_1 + x_2 + x_3 \leq 70, x_1, x_2, x_3 \geq 0$$

Q3. Solve the LPP by Big-M (Charne's Penalty) method:

$$\text{Min: } Z = 3x_1 + 2x_2 - x_3$$

$$\text{Subject to } 2x_1 + x_2 + x_3 = 20, x_1 + 3x_2 \geq 30$$

$$4x_1 + x_2 \leq 40, x_1, x_2, x_3 \geq 0$$

Q4. Solve the LPP by Two- Phase Simplex method. Then state the values of the optimal primal variables . Use condensed Tableau only.

$$\text{Min: } Z = 12x_1 + 16x_2 + 10x_3$$

$$\text{Subject to } 2x_1 + 6x_2 + 5x_3 \geq 61$$

$$4x_1 + 2x_2 + x_3 \geq 50, x_1, x_2, x_3 \geq 0.$$

Q5. Establish the relationship between a Primal Linear Programming Problem (P) and a Dual Linear Programming Problem (D).

Q6. Solve the Linear Programming Problem by Simplex method.

Then state the value of optimal primal and the dual variables.

$$\text{Max: } Z = 2x_1 + 9x_2$$

$$\text{Subject to } 2x_1 + 5x_2 \leq 19$$

$$-x_1 + 6x_2 \leq 16, 3x_1 - x_2 \leq 3, x_1, x_2 \geq 0$$

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