Code No: 138FG **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year II Semester Examinations, September - 2020
WATER RESOURCES SYSTEMS ANALYSIS
(Civil Engineering)

Time: 2 Hours **Max. Marks: 75**

Answer any Five Questions
All Questions Carry Equal Marks
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1.a) Describe in detail about systems approach and its types.
b) Distinguish between slack and surplus variable with an example [7+8]

2.a) Write the procedure involved for the Optimization of a function consisting of a single variable.
b) Discuss in detail the necessary conditions for the NLPP having one and more than one equality constraints to be maxima or minima. [8+7]

3. Evaluate (a) all the basic solutions (b) number of possible basic feasible solutions (c) Non- degenerate basic feasible solutions . [15]

$$\text{Maximize } Z = 12x_1 + 8x_2 + 14x_3 + 10x_4$$
$$\text{Subject to } 5x_1 + 4x_2 + 2x_3 + x_4 = 100$$
$$2x_1 + 3x_2 + 2x_3 + x_4 = 75$$
$$x_1, x_2, x_3, x_4 \geq 0$$

4.a) Why is a simplex method a better technique than graphical method for more cases?
b) Solve the following LPP by using Simplex method [8+7]

$$\text{Maximize } Z = 6x_1 - 3x_2 + 2x_3$$
$$\text{Subject to } 3x_1 + x_2 + x_3 \leq 16$$
$$4x_1 + 2x_2 + x_3 \leq 18$$
$$2x_1 - x_2 - 2x_3 \geq 8$$
$$x_1, x_2, x_3 \geq 0$$

5. Convert the following primal problem into dual problem and solve the LPP. [15]

$$\text{Maximize } Z = 5X_1 + 8X_2 + 4X_3$$
$$\text{subject to } 2X_1 + 3X_2 - X_3 \geq 10$$
$$X_1 + X_2 + 3X_3 \geq 5$$
$$2X_1 + 5X_2 - 2X_3 \leq 7$$
$$3X_1 - X_2 + 3X_3 \geq 9$$
$$X_1 + 5X_2 \geq 6$$
$$X_1, X_2, X_3 \geq 0$$

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6. A manufacturing company makes two products - P and R using two machines - A and B. Each unit of P that is produced requires 45 minutes processing time on machine A and 40 minutes processing time on machine B. Each unit of R that is produced requires 24 minutes processing time on machine A and 35 minutes processing time on machine B. At the start of the current week there are 43 units of P and 97 units of R in stock. Available processing time on machine A is forecast to be 40 hours and on machine B is forecast to be 35 hours. The demand for P is forecasted to be 70 units and for R is forecasted to be 95 units. Company policy is to maximize the combined sum of the units of P and the units of R in stock at the end of the production. Formulate the problem of deciding how much of each product to manufacture as a linear program. Solve this linear program using revised simplex method and state the procedure. [15]

7.a) Explain in detail the general objectives that can be formulated for a single purpose irrigation project.

b) Write a detailed note on Curse of Dimensionality. [8+7]

8.a) Explain the concept of cash flow diagram in the Economic analysis.

b) Write a detailed note on Pricing of water resources with suitable example. [7+8]

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