

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**ME - SEMESTER-II • EXAMINATION – SUMMER - 2017**

**Subject Code: 2723302****Date: 26/05/2017****Subject Name: Hydro System Engineering****Time: 02:30 PM To 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain various applications of system engineering in water resources management. **07**
- (b) Describe various components of artificial neural network with an illustrative example of water resources engineering. **07**
- Q.2** (a) Solve the following problem using linear programming **07**  
Minimize  $Z = 2X_1 + 3X_2$ , subject to the constraints  
 $X_1 + X_2 \geq 4$   
 $4X_1 + X_2 \geq 10$   
 $X_1 + 5X_2 \geq 12$   
 $X_1, X_2 \geq 0$
- (b) Explain objective function. How would you decide the objective function for a given problem, explain with an example. **07**
- OR**
- (b) Describe the graphical method of linear programming to solve a problem. **07**
- Q.3** (a) Explain the following terms **07**  
(1) Local minimum (2) Global minimum  
(3) Local maximum (4) Global maximum
- (b) Give a point-wise difference between primal simplex method and dual simplex method. **07**
- OR**
- Q.3** (a) Explain Kuhn-Tucker necessary conditions to solve non-linear programming problem. **07**
- (b) Describe dynamic programming in detail with its characteristics. **07**
- Q.4** (a) How would you carry out calibration and verification of a mathematical model? **07**
- (b) Describe fuzzy logic with its application in water resources engineering. **07**
- OR**
- Q.4** (a) Define the following terms in relation of linear programming **07**  
(1) Constraints (2) Feasible region (3) Infeasible region (4) Optimal solution  
(5) Bounded and unbounded region
- (b) Determine graphically the minimum value of the objective function **07**  
 $Z = -X_1 + X_2$ , Subject to the constraints  
 $2X_1 - X_2 \geq -5$   
 $3X_1 + X_2 \geq 3$   
 $2X_1 - 3X_2 \leq 12$   
 $X_1, X_2 \geq 0$

- Q.5** (a) Differentiate clearly between modeling and simulation and describe various components of simulation. **07**
- (b) Describe various hybrid techniques used in system engineering. **07**
- OR**
- Q.5** (a) Explain how you would allocate reservoir capacity optimally with the help of linear programming. **07**
- (b) Write short note on (1) Stochastic programming (2) Soft computing techniques **07**

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