

(Following Paper ID and Roll No. to be filled in your Answer Books)

**Paper ID : 100853**

Roll No.

**B.TECH.**

**Theory Examination (Semester-VIII) 2015-16**

**WATER RESOURCES SYSTEMS**

*Time : 3 Hours*

*Max. Marks : 100*

**Section-A**

- 1. Attempt all parts. All parts carry equal marks. Write answer of each part in short. (2×10 = 20)**
- (a) What do you mean by system?
  - (b) What are the basic techniques used in water resources system analysis?
  - (c) What is meant by decision variable?
  - (d) List out the components of a Simulation model.
  - (e) What is depreciation?
  - (f) What do you mean by Amortization?
  - (g) Mention the steps involved in multiobjective analysis.
  - (h) What is meant by Non-inferior solutions?

- (i) What is the difference between linear and non-linear programming?
- (j) What do you mean by optimal crop water?

### Section-B

#### 2. Attempt any 5 questions from this section.

(10×5 = 50)

- (a) Explain the various types of systems with an example for each.
- (b) Differentiate between concave and convex function in detail.
- (c) Examine the following functions for convexity/concavity and determine their values at the extreme points.

1.  $f(x) = x_1^2 + x_2^2 - 4x_1 - 2x_2 + 5$

2.  $f(x) = -x_1^2 - x_2^2 - 4x_1 - 8$

3.  $f(x) = -x_1^3 + x_2^3 - 3x_1 - 12x_2 + 20$

- (d) Explain step by step procedure of dual-simplex method.
- (e) A total of 6 units of water is to be allocated optimally to three users. The allocation is made in discrete steps of one unit ranging from 0 to 6. With the three users denoted as User 1, User 2 and User 3 respectively, the

returns obtained from the users for a given allocation are given in the following table.

Returns from Water Allocation

Amount of water Allocated $x$	Return from		
	User 1 $R_1(x)$	User 2 $R_2(x)$	User 3 $R_3(x)$
0	0	0	0
1	5	5	7
2	8	6	12
3	9	3	15
4	8	-4	16
5	5	-15	15
6	0	-30	12

Find out allocation to three users.

- (f) Discuss on multireservoir system for irrigation planning by linear programming in detail.
- (g) Explain weighing method and constraint method in formulating a multiobjective planning problem.

- (h) Write in detail about dynamic programming used in water resources system.

### Section-C

**Note: Attempt any 2 questions from this section.**

(15×2 = 30)

3. (a) Explain in detail about Graphical method and Simplex method.
- (b) Solve the following linear programming model and find out the optimal solution :
- Maximize =  $2x_1 + x_2$
- Subject to  $3x_1 + x_2 \leq 300$
- $4x_1 + 2x_2 \leq 300$
- $x_1, x_2 \leq 0$
4. (a) Discuss the conditions of project optimality in detail.
- (b) Explain in detail about benefit-cost analysis of a water resources project.
5. Explain the following in detail :
- (a) Reservoir operation for Irrigation by linear programming.
- (b) Real-time reservoir operation for Irrigation by dynamic programming.