

B.TECH
(SEM VIII) THEORY EXAMINATION 2018-19
WATER RESOURCE SYSTEMS

Time: 3 Hours

Total Marks: 100

Note: Attempt all Sections. If you require any missing data, choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

- a. What do you understand by water resource system?
- b. Differentiate between linear and non-linear programming?
- c. Define the concept of Simplex Algorithm
- d. What do you mean by Engineering Economics
- e. What are constrained and unconstrained optimization.
- f. What do you mean by Amortization?
- g. What are the basic components of an optimization problems
- h. What are the various types of simulation models.?
- i. What do you mean by optimal crop water?
- j. What is meant by Non-inferior solutions?

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

- a. What are the basic techniques used in water resources systems ? Explain in detail.
- b. Explain in detail about benefit-cost analysis of a water resources project.
- c. (i) Express the following LP problem in matrix notation :
Maximize $Z = 4x_1 + 5x_2$
subject to : $2x_1 + 3x_2 \leq 12$
 $4x_1 + 2x_2 \leq 16$
 $x_1 + x_2 \leq 8$
 $x_1, x_2 \geq 0$.
(ii) Solve the following by Graphical method :
Maximize $Z = 5x_1 + 7x_2$
subject to : $3x_1 + 4x_2 \leq 15$
 $2x_1 + 3x_2 \geq 12$
 $x_1, x_2 \geq 0$.
- d. Explain in detail about Graphical method and Simplex method.
- e. Discuss in detail about the Irrigation water allocation for single and multiple crops

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Explain the concept of a system. Give advantages and disadvantages of a system approach. Write a short note on hydrologic system
- (b) What are the basic problems in a system analysis ? Give examples for the prediction problems associated with surface water hydrology, ground water hydrology and reservoir problem.

4. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Examine the following functions for convexity/concavity and determine their values at the extreme points.

$$f(x) = x_1^2 + x_2^2 - 4x_1 - 2x_2 + 5 \quad f(x) = -x_1^2 - x_2^2 - 4x_1 - 8$$
$$f(x) = -x_1^3 + x_2^3 - 4x_1 - 12x_2 + 20$$

- (b) Enlist the various applications of linear and dynamic programming to water resources problems.

5. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Explain the Reservoir operation for Irrigation by linear and dynamic programming.
- (b) What is simulation. Compare between optimization and simulation. Discuss briefly various types of simulation models..

6. Attempt any *one* part of the following: 10 x 1 = 10

- (a) What is multi objective problem. How is non inferior solutions of multi objective problem can be determined.
- (b) Discuss in detail about the Multi- reservoir system for irrigation Planning

7. Attempt any *one* part of the following: 10 x 1 = 10

- (a) The demand curve for recreation at a reservoir site is determined as $4P + Y = 30$, where Y is the yearly demand curve and P is the price in standard unit. The annual demand was 10 without the reservoir and is expected to increase to 20 with the construction of the reservoir. Estimate the benefits of recreation arising from the construction of the reservoir
- (b) What are the various combination of multipurpose reservoir. Discuss about the optimal sizing and operation of a single multi purpose reservoir.