

**B.Tech. CIVIL ENGINEERING
(BTCLEVI)**

00196

Term-End Examination

June, 2014

**BICEE-015 : WATER RESOURCES SYSTEM
PLANNING AND DESIGN**

Time : 3 hours

Maximum Marks : 70

Note : Answer any seven questions. All questions carry equal marks. Use of non-programable scientific calculator is allowed. Assume any missing data.

1. Define the following terms with examples : 5+5
 - (a) Linear Programming
 - (b) Water Quality

2. Two crops are grown on a land of 200 ha. The cost of raising crop 1 is 3 unit/ha, while for crop 2 it is 1 unit/ha. The benefit from crop 1 is 5 unit/ha and from crop 2 it is 1 unit/ha. A total of 300 units of money is available for raising both crops. What should be the cropping plan (how much area for crop 1 and how much area for crop 2) in order to maximize the total net benefits ? 10

3. Maximize $z = 5x_1 + 8x_2$
 subject to $2x_1 + 3x_2 \geq 15$
 $3x_1 + 5x_2 \leq 60$
 $x_1 + x_2 = 18$
 $x_1 \geq 0, x_2 \geq 0.$

10

4. Which of the following plans is more economical at 6% interest ?

10

	<i>Plan A</i>	<i>Plan B</i>
Cost of Equipment	50,000	35,000
Annual O & M cost	2,000	2,500
Salvage value	7,000	6,000
Service life	30 years	15 years

Compare the two alternate plans by

- (a) Equivalent Annual cost.
 (b) Present worth comparison.

5. An urban catchment has an area of 0.85 km^2 . The slope of the catchment is 0.006 and maximum length of travel of water is 950 m. The maximum Rainfall depth with 25-year return period is as given below :

Duration (year)	5	10	20	30	40	60
Rainfall depth (m)	17	26	40	50	57	62

If a culvert for a drainage at the outlet is to be designed for a return period of 25 years, estimate

the required peak flow rate by rational formula [assume runoff coefficient = 0.3].

Time of concentration ($t_{c \min}$) can be calculated as

$$t_c = 0.01947 L^{0.77} S^{-0.385}$$

L = Maximum Travel Length (m), S = Slope. 10

6. Write short notes on the following : 2×5=10
- (a) Different optimization techniques and their application in Water Resources
 - (b) Water Quality Management Planning
7. (a) What are economic and financial aspects of Water Resource Planning and Management ? 5
- (b) What are the institutional aspects of Water Resource Planning and Management ? 5
8. (a) Describe the mass curve method for determining the storage capacity of a reservoir to be designed for a uniformly steady demand rate. 5
- (b) Discuss various methods of converting the point rainfall values at various stations into an average value over a catchment. 5

9. (a) Discuss the various data required to be collected for planning of Water Resource Project. 5
- (b) Discuss the structural and non-structural methods of flood control. 5
10. What do understand by the term “multi-objective planning” ? Discuss scope of multi-objective planning considering any case study. 10
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