

[Total No. of Questions - 9] [Total No. of Printed Pages - 3]  
(2125)

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**B. Tech 6th Semester Examination**  
**Water Resources & System Engineering (OS)**

CE-6003

**Time : 3 Hours**

**Max. Marks : 100**

*The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.*

**Note :** Attempt five questions in all, select one question from each sections A, B, C and D. Section E is compulsory.

**SECTION - A**

1. (a) What are the root causes of water resource problems? Explain their effects in details. How can you tackle these problems? (10)
- (b) List and explain the factors affecting the consumptive use of water. (10)
2. Describe in detail the empirical-area-reduction method for determining the sediment distribution in a reservoir. (20)

**SECTION - B**

3. (a) Briefly explain the discounting factors and its types. What is their role in water resources and system engineering? (10)
- (b) An amount of Rs. 1000 is invested each in projects A and B. Project A returns Rs. 200 at the end of year for 10 years while Project B returns Rs. 130 at the end of the year for 20 years. Rank the projects on the basis of Benefit Cost ratio method if the discount rate is 4%. Also, rank them if the discount rate is 11%. (10)

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4. (a) Write down in detail the steps involved in the Benefit-Cost analysis of a project. (5)
- (b) A city plans to augment its water supply system. There are two project alternatives under consideration. One alternative calls for the construction of a storage dam and a treatment plant which would cost Rs. 48, 00,000 and would satisfy the estimated demand over the next 12 years. The expected annual operating cost would be Rs. 300,000. After 12 years, a second dam and additional treatment facility would be constructed with an additional operating cost of Rs. 2,50,000. The second alternative calls for the construction of a single large storage dam which together with a new treatment plant would cost Rs. 62,00,000. The annual operating cost is Rs.2,60,000 for the first 12 years. After 12 years additional treatment facilities would be added for Rs. 5,00,000 and annual operating cost would be Rs. 3,20,000. Examine which of the two alternatives is better for adoption. Rate of interest may be assumed uniform at 8%. (Use present worth and rate of return method) (15)

**SECTION - C**

5. Differentiate between simulation and optimization model. What are the advantages of combining them? (20)
6. What do you mean by the term analog simulation? Enlist briefly the limitations of this type of simulation. (20)

**SECTION - D**

7. Discuss the applications of system engineering in irrigation and drainage engineering. Which technique is most suitable for irrigation management? (20)
8. Describe different mathematical models used in water resource planning and development. Compare different models on the basis of ease of application. (20)

**SECTION - E**

9. Attempt all the parts:
- (a) Differentiate b/w snow and hail.
  - (b) What are the steps involved in planning a Water Resources project?
  - (c) What do you mean by the term incremental benefit?
  - (d) Write down the difference between separable and non-separable cost.
  - (e) What is process of Simulation modelling?
  - (f) Write down the difference between tube - well and spring,
  - (g) What do you mean by the term "reservoir capacity"?
  - (h) Explain the term "rate of return method".
  - (i) What is profitability analysis?
  - (j) Define dynamic programming. (10×2=20)