[Total No. of Questions - 9] [Total No. of Printed Pages - 4] (2064)

14705

B. Tech 6th Semester Examination

Water Resources and System Engineering

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) Describe the functional requirements of various uses in a multipurpose water-resources project. What is the compatibility of these uses in the project?

   (b) Discuss inter-basin transfer of water in the context of our country. (15+5=20)

2. (a) The annual run off data over the catchment area of a reservoir for a successive number of years are given below:

Year	1	2	3	4	5	6	7	8
Run off (cm)	98	143.5	168.3	94	95.3	152.4	110	131.3

   Determine (i) the average yield from the catchment and (ii) storage capacity of the reservoir to use the source fully. Solve analytically. Given, Catchment area = 1675 km^2.

   (b) Draw a diagram showing the various zones of storage in a reservoir. (15+5=20)

SECTION - B

3. The data pertaining to a flood protection project to provide full safety against floods up to 50 years frequency are as follows:

   Cost of project = Rs. 50 lacs

   Life of the project = 50 years

   Interest rate = 6.5%

   Maintenance cost = 2% of the capital cost

   The following additional information is available

Flood frequency (years)	0	5	10	15	30	40	70
Annual damages Rs. ($\times 10^4$)	2	25	40	45	61	71	75

   Find (i) Annual cost (ii) Annual benefits and (iii) Benefit-cost ratio of the project. (20)

4. A 1000 mm diameter pipeline can be installed for Rs. 2 lacs. The annual operating and maintenance cost is estimated at Rs. 40000/-. An alternative 750 mm diameter pipeline can be installed at Rs. 1.6 lacs. Its annual operating and maintenance cost is estimated at Rs. 60000/- Either pipeline is expected to serve for 35 years, with 7% salvage when replaced. Compare the two pipelines assuming a 15% rate of interest. (20)

SECTION - C

5. (a) Explain, (i) General structure of a linear programming problem (ii) Feasible space and (iii) Initial basic feasible solution.

   (b) Discuss risk and uncertainty in project evaluation.

   (15+5=20)

6. Solve the following linear programming problem graphically:

Maximize $z = (3x_1 + 5x_2)$ subject to

$(x_1 + 2x_2) \leq 2000$

$(x_1 + x_2) \leq 1500$

$x_2 \leq 600$ and $x_1, x_2 \geq 0$ (20)

SECTION - D

7. Four water resources projects are to be allocated from limited funds in a small district. These projects produce net independent returns as shown below. Using dynamic programming, determine the optimal allocation of 1 million rupees.

Investment Rs. (x 10^5)	Net returns from a project Rs. (x 10^4)			
	Project 1	Project 2	Project 3	Project 4
2	4	2	6	6
4	0	3	12	1
6	6	4	12	6
8	9	5	12	15
10	10	6	12	12

(20)

8, (a) Discuss the applications of system engineering in water resources projects.

(b) Explain the use of mathematical models in forecasting hydrological events. (10+10=20)

SECTION - E

9. (i) Discuss the role of water in the development of water resources.

(ii) What is watershed management and what are its elements?

(iii) Explain reservoir sedimentation.

(iv) Enumerate the various steps involved in the planning of a water resources project.

(v) Differentiate between micro and macro economics.

(vi) Explain the term capital recovery factor.

(vii) Discuss system engineering.

(viii) What is dynamic programming? How it differs from linear programming?

(ix) Describe principle of optimality.

(x) What is simulation and what are its limitations?

(2x10=20)