Total No. of printed pages = 3

CE 1817 PE 12

Roll No. of candidate

31/12/22   **2022**

B.Tech. 7th Semester End-Term Examination

CE

Elective I — WATER RESOURCES ENGINEERING

(New Regulation (w.e.f. 2017-18) and New Syllabus (w.e.f. 2018-19))

Full Marks – 70   Time – Three hours

The figures in the margin indicate full marks
for the questions.

Answer question No. 1 and any *four* from the rest.

1. Fill up the gaps with appropriate word/words. (any *ten*) $(10 \times 1 = 10)$

    (a) Trap efficiency of a reservoir is the ratio of the ———— of sediment trapped to the ———— of incoming sediment.

    (b) Construction of the dam in stages ———— reservoir trap efficiency.

    (c) The economic height of a dam is that height of the dam corresponding to which, the cost of the dam per unit of ———— is minimum.

    (d) The economic life of a reservoir is generally ———— than the useful life.

    (e) Temperature, humidity, wind velocity, hours of sunshine, cloud cover, radiation data falls under the category of ———— data.

    (f) In reservoir operation policy, lower rule curve in a multi-purpose project is used to protect ———— throughout the year.

    (g) For optimal crop water requirements, an accurate estimation of crop coefficient and ———— is required.

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(h) In comparison to thermal power, operation cost is ———— in case of hydropower.

(i) As far as possible, a dam site should be ———— from the up stream tributaries of the river.

(j) The values that cannot be expressed in monetary terms are called ———— values.

(k) Estimated Separable cost for a function in a multipurpose project is the total project cost ———— the estimated cost of the project with that function omitted.

(l) Water requirement for hydro-power use is not ————.

(m) For a dam project, Investigation of geology is must to know about the possible ———— problems.

2. (a) What are the broad steps involved in planning of a water resources project? (5)

(b) What are the points to be considered in selecting a suitable reservoir site for a water resources project? (10)

3. (a) What is sunk cost? Explain with example. (5)

(b) A project needs four years of construction. The expenditures in 1st, 2nd, 3rd and 4th years are 1000, 2000, 3000 and 4000, respectively. The life of the project after completion of construction is 30 years. The estimated benefits from the project after completion are 400, 800, 1200 and 1600 in the first three years respectively and 2000 for the remaining years. The annual operation and maintenance cost is 350 for the first 15 years of project life (after construction period) and 550 for the remaining years. Find the benefit cost ratio for the project on the first day of construction. Assume an interest rate of 8% and all the money transactions are made at the last day of each year. All money values are in lakh of Rupees. (10)

4. (a) What is upper rule curve? How it is used in reservoir operation? (5)

(b) The gross and dead storage capacities of a multi-purpose reservoir are 250 and 65 million metre cube (MCM) respectively. The relationship between area (A) in million sq. m and storage (S) in MCM is: (10)

$A = 0.23S + 8$

The inflow discharge, average rate of evaporation and water demands for water supply (WS), irrigation (IRR) and water export (WE) for 5 consecutive months are given below :

Month	Inflow (MCM)	Av rate of evp (m)	Demand (MCM)		
			WS	IRR	WE
1	105	0.09	9	85	45
2	120	0.08	9	115	50
3	470	0.08	9	155	125
4	300	0.07	9	160	100
5	150	0.07	9	180	80

Prepare a working table for the given data. The hierarchy of water use is maximum for water supply and least for water export.

5. (a) What are the different levels at which planning is done? (5)

   (b) Using the data given below, calculate the allocations to each project purpose by Remaining Benefits Method. (10)

Project function (crores Rs.)	Separable cost (crores Rs.)	Estimated benefits (cross Rs.)	Alternate single purpose cost (crores Rs.)
Flood mitigation	380	500	400
Hydropower	600	.1500	1000
Irrigation	150	350	600
Navigation	50	100	80

6. (a) What are the different phases of project planning? (5)

   (b) What ate the common drawbacks in project planning? (10)

7. (a) What are the common causes of river bank erosion? (5)

   (b) A river bank in a river reach is under active erosion. The design discharge, design HFL, LWL and velocity of flow at the site are 960 cumec, 52.48 m, 46.51 m and 3.2 m/s respectively. The silt factor is 0.9. Design a boulder rip-rap for protection of the river bank. Assume, angle of repose of boulder as 30°. (10)