Total No. of printed pages = 3

CE 1817 PE 12

Roll No. of candidate | | | | | | | | | | |

 2021

B.Tech. 7th Semester Examination

CE

WATER RESOURCES ENGINEERING

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

Full Marks – 70 Time – Three hours

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

1. Answer ALL questions.

   (a) Distinguish between run-of river projects and storage projects. (2)

   (b) Distinguish between base load plant and peak load plant. (2)

   (c) What are the functions of spurs? (3)

   (d) Name the important factors that affect river bank erosion. (3)

2. Answer any *four* questions. (4 × 5 = 20)

   (a) What are the steps involved in planning of a water resources project?

   (b) With a neat sketch, show the sediment accumulation pattern in a reservoir.

   (c) What are the pre-construction measures for reducing sediment accumulation in a reservoir?

   (d) What are the different phases of project planning?

   (e) How the capacity of a potential reservoir site is estimated?

3. Answer any *four* questions. (4 × 10 = 40)

   (a) What are the different types of investigations that are required for planning of a water resources project? Name possible sources of these data.

   (b) Discuss how reservoir operation rule curves are used for protecting the downstream area from flood and safe guarding the water supply release for the entire year.

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(c) A project needs four years of construction period. The expenditures in first, second, third and fourth year are 50, 100, 150 and 200 respectively. The life of the project after completion of construction is 35 years. The estimated benefits from the project after completion are 20, 40, 60, and 80 in the first four years respectively and 100 for the remaining years. The O & M cost of the project after completion of construction is 5 for the first 25 years and 10 for the remaining 10 years. Find the present worth of the project on the first day of construction. Assume an interest rate of 7% and all the money transaction are made at the end of each year. All money values are in lakh of rupees.

(d) The gross and dead storage capacities of a multi-purpose reservoir are 200 and 50 million metre cube (MCM), respectively. The relationship between area (A) in million sq. m and storage (S) in MCM is:

$A = 0.18S + 7$

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 evaporation (m)	DEMAND (MCM)		
			WS	IRR	WE
1	85	0.09	7	65	40
2	110	0.08	7	110	50
3	450	0.08	7	150	125
4	280	0.07	7	160	100
5	150	0.07	7	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.

(e) Using the data given below, calculate the allocations to each project purpose by Alternative Justifiable Expenditure method. Total project cost is Rs. 3750 crores.

Project function (Crores Rs.)	Separable cost (Crores Rs.)	Estimated benefits (Crores Rs.)	Alternate single purpose cost (Crores Rs.)
Flood mitigation	350	500	400
Hydropower	800	2000	2500
Irrigation	300	450	800
Navigation	200	250	300

(f) Design a boulder rip-rap to protect a river reach from erosion. The necessary data is given below. Assume any data not given.

Parameter	Value
Design discharge (Q)	33,092 cumec
Design High Flood Level	31.60 m
Low Water Level	22.98 m
Velocity of flow (V)	3.0 m/s
Specific gravity of boulder (S_s)	2.65
Silt factor (f)	1.0
Angle of repose of boulder (φ)	30°