BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE
(AUTONOMOUS)
III - B.Tech I-Semester Regular Examinations (BR23), DECEMBER - 2025
ENGINEERING HYDROLOGY (CIVIL ENGINEERING)

Time: 3 hours | Course Code: 23CE5T02 | Max. Marks: 70

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*Question Paper consists of **Part-A** and **Part-B***
*Answer **ALL** the question in **Part-A and Part-B***

PART–A (10X2 = 20M)

		Marks	CO	BL
1. (a)	Define catchment area and write water-budget equation.	(2M)	C312.1	BL1
1. (b)	Define mass curve and hyetograph along with its graphical representation.	(2M)	C312.1	BL1
1. (c)	Define Potential Evapotranspiration and Actual Evapotranspiration.	(2M)	C312.2	BL1
1. (d)	Define Φ-Index and W-Index. Also write its formula.	(2M)	C312.2	BL1
1. (e)	Differentiate between interflow and baseflow.	(2M)	C312.3	BL2
1. (f)	Define unit hydrograph and effective rainfall.	(2M)	C312.3	BL1
1. (g)	What is flood and write down the causes of flood.	(2M)	C312.4	BL1
1. (h)	Define flood routing and write down Muskingum equation.	(2M)	C312.4	BL1
1. (i)	Define specific yield and specific retention.	(2M)	C312.5	BL1
1. (j)	State Darcy's law.	(2M)	C312.5	BL2

PART–B (5X10 = 50M)

2	Explain "Hydrological Cycle" and its components with neat sketch.	10(M)	C312.1	BL3
	(OR)			
3	A catchment area has six raingauge stations. In a year, the annual rainfall recorded by the gauges are as follows:	10(M)	C312.1	BL5

Station	A	B	C	D	E	F
Rainfall (cm)	82.6	102.9	180.3	110.3	98.8	136.7

a) Determine the standard error in the estimation of mean rainfall in the existing set of raingauges.
b) For a 10% error in the estimation of the mean rainfall, calculate the optimum number of raingauge stations in the catchment.

4	Define Evaporation. Explain the factors affecting evaporation and also explain the measures to be taken to reduce the evaporation losses.	10(M)	C312.2	BL1
	(OR)			
5	Define infiltration capacity. The infiltration capacity in a basin is represented by Horton's equation – where is in cm/hr and is in hours. Assuming the infiltration to take place at capacity rates in a storm of 60 minutes duration, estimate the depth of infiltration in – i. the first 30 minutes.	10(M)	C312.2	BL5

	ii. the second 30 minutes of the storm.			

6	Annual rainfall and runoff values (in cm) of a catchment spanning a period of 21 years are given below. Analyse the data to – i. Estimate the 75% and 50% dependable annual yield of the catchment. ii. Develop a linear correlation equation to estimate annual runoff volume for a given annual runoff value.	10(M)	C312.3	BL6

Year	Annual rainfall (cm)	Annual runoff (cm)	Year	Annual rainfall (cm)	Annual runoff (cm)
1975	118	54	1986	75	17
1976	98	45	1987	107	32
1977	112	51	1988	75	15
1978	97	41	1989	93	28
1979	84	21	1990	129	48
1980	91	32	1991	153	76
1981	138	66	1992	92	27
1982	89	25	1993	84	18
1983	104	42	1994	121	52
1984	80	11	1995	95	26
1985	97	32			

	(OR)			
7	Define Hydrograph. Draw a proper labelled sketch of hydrograph and explain the factors affecting runoff hydrograph.	10(M)	C312.3	BL3

8	Analysis of annual flood series of a river yielded a sample mean of 1000 m^3/sec and standard deviation of 500 m^3/sec. Estimate the design flood of a structure on this river to provide 90% assurance that the structure will not fail in the next 50 years. Use Gumbel's method and assume the sample size to be very large. Take and	10(M)	C312.4	BL4
	(OR)			
9	Differentiate between – i. Hydraulic routing and Hydrologic routing ii. Reservoir routing and Channel routing	10(M)	C312.4	BL2

10	Explain different types of aquifers.	10(M)	C312.5	BL2
	(OR)			
11	a) Derive the equation for the steady flow in a confined aquifer. b) A 30 cm diameter well completely penetrates a confined aquifer of permeability 45 m/day. The length of the strainer is 20 m. Under steady state of pumping, the drawdown at the well was found to be 3 m and the radius of influence was 300 m. Calculate the discharge.	10(M)	C312.5	BL6

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