

**BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE
(AUTONOMOUS)**

III - B. Tech I-Semester Supplementary Examinations (BR23), Mar/Apr - 2026

ENGINEERING HYDROLOGY (CIVIL)

Time: 3 hours

Max. Marks: 70

*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) Write the formula of determining average rainfall using Thiessen Polygon method and Isohyetal method. | (2M) | CO1 | BL1 |
| b) Define mass curve and hyetograph along with its graphical representation. | (2M) | CO1 | BL1 |
| c) Define interception and depression storage. | (2M) | CO2 | BL1 |
| d) Define Φ -Index and W-Index. Also write its formula. | (2M) | CO2 | BL1 |
| e) Define runoff and write its components. | (2M) | CO3 | BL1 |
| f) Write the assumptions of unit hydrograph. | (2M) | CO3 | BL1 |
| g) Define risk and reliability. | (2M) | CO4 | BL1 |
| h) Define flood routing and write down Muskingum equation. | (2M) | CO4 | BL1 |
| i) Define specific yield and specific retention. | (2M) | CO5 | BL1 |
| j) State Darcy's law and write its assumptions. | (2M) | CO5 | BL2 |

PART-B (5X10 = 50M)

- 2 Explain "Hydrological Cycle" and its components with neat sketch. 10(M) CO1 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) CO1 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.
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- 4a. a) Define Evapotranspiration. Explain the types of evapotranspiration. 5(M) CO2 BL1
- b. b) Explain the factors affecting evapotranspiration. 5(M) CO2 BL1
- (OR)**
- 5a. Define infiltration capacity. 3(M) CO2 BL1
- b. The infiltration capacity in a basin is represented by Horton's equation

$$f_p = 3.0 + e^{-2t}$$
7(M) CO2 BL5

where f_p is in cm/hr and t 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

- a) the first 30 minutes.
- b) 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 develop a linear correlation equation to estimate annual runoff volume for a given annual runoff value. 10(M) CO3 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)

- 7a. Define Hydrograph. Draw a proper labelled sketch of hydrograph and explain the components of hydrograph. 6(M) CO3 BL5
- b. Explain the factors affecting hydrograph. 4(M) CO3 BL2
- 8 The following data give flood-data statistics of two rivers: 10(M) CO4 BL4

River	Length of records (years)	Mean annual flood (m^3/sec)	σ_{n-1}
Ganga at Raiwala	92	6437	2951
Yamuna at Tajewala	54	5627	3360

Estimate the 100 and 1000-year floods for these two rivers by using Gumble's method. If needed, take $\bar{y}_n = 0.577$ and $S_n = 1.2825$

(OR)

- 9a. Differentiate between – 5(M) CO4 BL2
- i. Hydraulic routing and Hydrologic routing
 - ii. Reservoir routing and Channel routing
- 10 Explain different types of aquifers. 10(M) CO5 BL2

(OR)

- 11a. Derive the equation for the radial flow to a well in a confined aquifer. 5(M) CO5 BL6
- b. The discharge from a fully penetrating well operating under steady state in a confined aquifer of 30 m thickness is 2100 litres/minute. The drawdowns observed at two observation wells located at 15 m and 150 m from the well are 3.2 m and 0.28 m respectively. Determine the transmissibility and permeability of the aquifer. 5(M) CO5 BL5
