Graphic Era HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

End Term (Odd) Semester Examination November 2025

Name of the Course: B.Tech. Civil Engineering — Semester: V
Name of the Paper: Hydrology and Irrigation Engineering — Paper Code: TCE-504
Time: 3Hours — Maximum Marks: 100

Note:-

- All questions are compulsory.
- Answer any two sub questions among a, b & c in each main question.
- Total marks in each main question are twenty.
- Each sub question carries 10 marks

Q1 (20marks)

(a) Explain in brief a method for testing the consistency of rainfall record at a station and necessary adjustment

(b) Storm with 10 cm precipitation produced a direct runoff 5.8 cm. Given the time distribution of the storm as below, estimate the φ-index of the storm

Time from start (hr)	1	2	3	4	5	6	7	8
Rainfall in each hr. in cm	0.4	0.9	1.5	2.3	1.8	1.6	1	0.5

(c) The precipitation on a catchment in Dehradun of area 95 km^2 is sampled in table . Determine the precipitation recorded by station number (7) if the mean precipitation, as computed by Thiessen method, amounts to 98 mm

Rain gauge	Recorded rainfall, Feb.2025(mm)	Thiessen polygon on area (km^2)
1	84	4
2	90	4
3	120	10
4	86	5.1
5	87	15.1
6	77	30.6
7	X	6.2
8	131	20

CO 1

Q2 (20marks)

(a) Define Unit hydrograph and discuss the assumptions and Limitation made in the Unit hydrograph theory.

(b) The peak of flood hydrograph due to 3-hr duration isolated storm in a catchment is 270 cumecs.the total depth of rainfall is 5.9 cm.Assuming an average infiltration loss of 0.3 cm/h and a constant base flow of 20 cumecs and area of catchment is 567 km^2,estimate
The peak of the 3-hr unit hydrograph of this catchment
The base width of the 3-hr unit hydrograph by assuming it to be triangular in shape

(c) According to Gumbel's, the estimate flood peaks for a river, based on year of data, for two return periods are:

Return period (years)	Peak flood (m^3/s)
100	485
50	445

CO 2

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	Estimate the magnitude of peak flood in river with a return period 500 years	
Q3	(20marks)	
(a)	Establish a relation between Duty of water, Delta and Base period. Discuss the factors on which duty of water depends.	**CO 3**
(b)	Derive the Dupuits formula for a discharge of a well in confined aquifer assuming equilibrium flow conditions. State all the assumptions made.	
(c)	A 30 cm well completely penetrates an unconfined aquifer of depth 40 m. After a long period of pumping at a steady rate of 1500 lpm, the drawdown in two observation wells 25 m and 75 m from the pumping well were found to be 3.5 m and 2.0 m, respectively. Determine the transmissibility of the aquifer. What is the drawdown at the pumping well ?	
Q4	(20marks)	
(a)	Describe the different methods of irrigation and discuss the conditions favorable for their adoption, their advantages and limitations.	**CO 4**
(b)	What are the factors that affect the pattern of sediment deposition in a reservoir?	
(c)	Following data pertain to monthly flows in river at a particular site.	

month	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Flow in m^3/sec	70	55	45	30	25	35	60	90	115	100	90	80

Determine the minimum storage required so as to supply constant discharge of 50 m^3/sec.

Q5	(20marks)	
(a)	Briefly describe and discuss the various methods of lining irrigation canals. Give a cross-section of a lined canal	**CO 5**
(b)	What are the different types of cross drainage works? State the conditions under which each one is adopted. Sketch any one of them.	
(c)	Design a channel in allowed soil for the following data by kennedy methods taking values of the coefficient and exponents in kennedy formula as 0.55 and 0.64 full supply discharge =50m^3/sec $\frac{R}{D} = 11$ Side slope= 0.5H:1V CVR (m)=1.0 N=0.0225	