Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Semester Examination, May 2025

Course: Hydrological Modelling **Semester:** VI

Program: B.Tech. (Sustainability Engineering) **Time:** 03 hrs.

Course Code: SUEN3005 **Max. Marks:** 100

Instructions: *1. Read all questions carefully before attempting.*
2. In numerical, show formulas, necessary calculations, units, and assumptions clearly.
3. Write legibly and neatly. Illegible answers may result in less marks.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Explain water as a blessing and as a curse.	**4**	**CO2**
Q 2	What are the forms of precipitation? Explain.	**4**	**CO1**
Q 3	What is evapotranspiration?	**4**	**CO1**
Q 4	What is difference between calibration and validation of a hydrologic model?	**4**	**CO2**
Q 5	In what scenarios would a lumped integral model be preferred over a distributed differential model?	**4**	**CO2**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Sketch a single-peaked hydrograph, and explain its components? Additionally, describe the practical steps involved in interpreting the different parts of the hydrograph to understand the flow characteristics of a river or stream.	**10**	**CO3**
Q 7	Analyze in detail the various factors that affect a runoff hydrograph. How do these factors interact to influence the shape and characteristics of the hydrograph, and what implications do they have for flood prediction and water resource management?	**10**	**CO3**
Q 8	Evaluate how various catchment characteristics affect the runoff of a stream. What specific factors within the catchment area influence the volume and timing of runoff, and how do these factors interact to shape the overall hydrological response of the stream?	**10**	**CO4**
Q 9	Evaluate practical examples of flood types and their typical impacts on affected areas for all common types of floods. **OR** Differentiate between hydrologic and hydraulic flood routing in detail. Additionally, describe practical examples of each method and explain how they are applied in real-world flood management scenarios.	**10**	**CO3**

SECTION-C
(2Qx20M=40 Marks)

Q 10 — **20** — **CO4**

The isohyetal map for 24 hours storm gave the areas enclosed between different isohyets, as follows:

Isohyets (mm)	21	20	19	18	17	16	15	14	13	12
Enclosed area (km^2)	543	1345	2030	2545	2955	3280	3535	3710	3880	3715

Determine the average depth of rainfall over the basin.

Q 11 — **20** — **CO4**

The various data were obtained for rains of various durations at a station for 31 years. The records were analyzed and eleven worst storms of various durations have been stipulated in their decreasing order, as shown in Table:

5 minutes		*10 minutes*		*15 minutes*		*30 minutes*		*60 minutes*		*90 minutes*		*120 minutes*	
Year	*Ppt. in cm*	*Year*	*Ppt. in cm*	*Year*	*Ppt. in cm*	*Year*	*Ppt. in cm*	*Year*	*Ppt. in cm*	*Year*	*Ppt. in cm*	*Year*	*Ppt. in cm*
1908	*0.85*	*1908*	*1.20*	*1908*	*1.40*	*1908*	*1.74*	*1908*	*2.15*	*1908*	*2.46*	*1915*	*2.97*
1921	*0.76*	*1915*	*1.04*	*1915*	*1.18*	*1904*	*1.55*	*1904*	*1.92*	*1915*	*2.38*	*1908*	*2.63*
1915	*0.73*	*1921*	*0.93*	*1904*	*1.11*	*1915*	*1.36*	*1915*	*1.70*	*1904*	*2.14*	*1904*	*2.34*
1934	*0.72*	*1904*	*0.88*	*1921*	*1.03*	*1921*	*1.22*	*1926*	*1.45*	*1921*	*1.81*	*1921*	*2.12*
1929	*0.66*	*1926*	*0.84*	*1926*	*0.97*	*1926*	*1.18*	*1921*	*1.40*	*1926*	*1.65*	*1926*	*1.83*
1926	*0.62*	*1934*	*0.80*	*1934*	*0.92*	*1931*	*1.10*	*1914*	*1.33*	*1914*	*1.50*	*1917*	*1.64*
1931	*0.51*	*1929*	*0.78*	*1929*	*0.90*	*1934*	*1.05*	*1931*	*1.25*	*1931*	*1.40*	*1914*	*1.55*
1904	*0.45*	*1931*	*0.68*	*1931*	*0.82*	*1929*	*1.01*	*1934*	*1.20*	*1917*	*1.36*	*1931*	*1.51*
1917	*0.36*	*1911*	*0.52*	*1911*	*0.67*	*1911*	*0.95*	*1929*	*1.14*	*1934*	*1.34*	*1934*	*1.46*
1914	*0.28*	*1917*	*0.51*	*1917*	*0.62*	*1917*	*0.83*	*1911*	*1.11*	*1929*	*1.27*	*1929*	*1.41*
1911	*0.21*	*1914*	*0.39*	*1914*	*0.50*	*1914*	*0.79*	*1917*	*1.09*	*1911*	*1.23*	*1911*	*1.34*

Plot the intensity-duration curves for storms of frequencies 11 and 1.4

OR

The maximum values of 24 hours summer precipitation at a rain gauge station are indicated below:

Year	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
Rainfall (cm)	10.7	11.2	10.8	9.6	14.9	15.2	12	12.2	15.8	16.8

Year	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
Rainfall (cm)	9.7	11.3	11.6	11.9	12.4	12.7	6.4	10.5	9.2	18.7

Year	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Rainfall (cm)	17.1	17.7	16.9	15.4	13.8	12.9	16.3	15.7	16.6	17.2

Estimate the maximum precipitation having a recurrence interval of
(a) 5 years (b) 10 years (c) 20 years.