U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: VI**

Branch: Civil Engineering **Duration: 3 hrs.**

Course Code: 23CV6PCHIE **Max Marks: 100**

Course: Hydrology and Irrigation Engineering

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			CO	PO	Marks
		UNIT - I			
1	a)	Explain with neat sketch, Horton's qualitative representation of hydrological cycle.	CO1	PO1	**06**
	b)	Define precipitation. Explain different forms of precipitation.	CO1	PO1	**06**
	c)	The average rainfall in cm at four existing rain gauge station in a basin are 105, 79, 70 and 66. If the average depth of rainfall over the basin is to be estimated within 10% error, determine the additional number of rain gauges required.	CO1	PO1	**08**
		OR			
2	a)	With a neat sketch, explain the working of Symon's type rain gauge.	CO1	PO1	**06**
	b)	Explain the concept of determining the optimum number of rain gauge stations in a catchment.	CO1	PO1	**06**
	c)	The annual rainfall data for the period 1990-2008 is presented, construct a 3-year moving average curve.	CO1	PO1	**08**

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Rainfall (mm)	525	620	430	280	315	400	710	595	375	560
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	-
Rainfall (mm)	575	420	540	450	380	305	450	1025	915	-

		UNIT - II			
3	a)	With a neat sketch, explain how evaporation can be measured using IS class A pan.	CO1	PO1	**06**
	b)	Explain the factors affecting infiltration capacity.	CO1	PO1	**06**

	c)	A 6 hour storm produced rainfall intensities of 1, 18, 25, 12, 10 and 6 mm/hr in successive one hour intervals over a basin of 800 sq.km. The resulting runoff observed as 2640 hectare-meters. Determine the Φ index for the basin.	*CO1*	*PO1*	**08**
		OR			
4	a)	Describe the working of a double ring infiltrometer used for measuring the infiltration rate.	*CO1*	*PO1*	**06**
	b)	Explain the concept of the ϕ-index and its significance in hydrology.	*CO1*	*PO1*	**06**
	c)	An urban catchment has an area of 85 ha. The slope of the catchment is 0.006 and maximum length of travel of water is 950 m. The maximum depth of rainfall with a 25 year return period is as below. Duration (min): 5, 10, 20, 30, 40, 60 Depth of rainfall (mm): 17, 26, 40, 50, 57, 62 If a culvert for drainage at the outlet of this area is to be designed for a return period of 25 years, estimate the required peak-flow rate, by assuming the runoff coefficient as 0.3.	*CO1*	*PO1*	**08**
		UNIT - III			
5	a)	State the assumptions underlying the unit hydrograph theory and describe its practical applications.	*CO1*	*PO1*	**06**
	b)	With a neat sketch explain the components of hydrograph.	*CO1*	*PO1*	**06**
	c)	Following are the ordinates of a 3 hour unit hydrograph. Derive and plot the 3 hour flood hydrograph due to an excess rainfall of 4.5 cm Time (hours): 0, 3, 6, 9, 12, 15, 18, 21, 24 3hrs UHG ordinates (m^3/s): 0, 1.5, 4.5, 8.6, 12, 9.4, 4.6, 2.3, 0.8	*CO1*	*PO1*	**08**
		OR			
6	a)	Define Runoff. Explain the factors affecting the Runoff.	*CO1*	*PO1*	**08**
	b)	The stream has the trapezoidal section with base width of 10 m and side slope of 2H: 1V in a reach 1000 m. In order to compute the flood discharge in a stream by slope area method, the following data has been obtained. Estimate the discharge in the stream if the coefficient of eddy loss is 0.3 for gradual expansion and 0.1 for gradual contraction. Upstream: Elevation of Bed 1100 m, Stage 1103.2 m, Remarks n = 0.03 Downstream: Elevation of Bed 1097.3 m, Stage 1101.0 m	*CO1*	*PO1*	**12**
		UNIT - IV			
7	a)	Define irrigation. List and explain any two types of flow irrigation.	*CO2*	*PO1*	**08**
	b)	A water course commands an irrigated area of 1000 hectares. The intensity of irrigation for rice in this area is 70%. The transplantation of rice crop takes 15	*CO2*	*PO1*	**12**

			days and during the transplantation period the total depth of water required by the crop on the field is 500 mm. During the transplantation period, the useful rain falling on the field is 120 mm. Find the duty of irrigation water for the crop on the field during transplantation, at the head of the field and also at the head of the water course assuming losses of water to be 20% in the water course. Also calculate the discharge required in the water course.			
			OR			
	8	a)	Define duty, delta and base period. Explain the factors affecting the duty of water.	*CO2*	*PO1*	**08**
		b)	A certain crop is grown in an area of 3000 hectares which is fed by a canal system. The data pertaining to irrigation are as follows: Field capacity of soil= 26% Optimum moisture = 12%, Permanent wilting point = 10%, Effective depth of root zone is 80 cm and relative density of soil=1.4. If the frequency of irrigation is 10 days and the overall efficiency is 23%, find (i) the daily consumptive use (ii) The water discharge in m^3/sec required in the canal feeding the area.	*CO2*	*PO1*	**12**
			UNIT - V			
	9	a)	Explain the efficiency terms involved in achieving the more efficient irrigation.	*CO2*	*PO1*	**10**
		b)	The base period, duty at the field of difference crops, and area under each crop in the command area are given below. Find the required reservoir capacity to cater to the needs of the crops. **Crops** / **Base period (days)** / **Duty @ field (Ha/cumec)** / **Intensity of irrigation (%)** **Wheat** 120 1800 20 **Sugar cane** 360 1700 20 **Cotton** 180 1400 10 **Rice** 120 800 15 **Vegetables** 120 700 15	*CO2*	*PO2*	**10**
			OR			
	10	a)	Define the following terms: (i) time factor, (ii) capacity factor, (iii) kor watering, and (iv) paleo irrigation.	*CO2*	*PO1*	**04**
		b)	Write a brief note on distribution system for canal irrigation.	*CO2*	*PO1*	**06**
		c)	The gross commanded area for a distributary is 20000 hectares, 75% of which can be irrigated. The intensity of irrigation for Rabi season is 40% that for Kharif season is 10%. If kor period is 4 weeks for wheat (Rabi) and 2.5 weeks for rice (Kharif), determine the outlet discharge. Outlet factors for wheat and rice may be assumed as 1800 hectares/ cumec and 775 hectares/ cumec. Also calculate delta for each crop.	*CO2*	*PO2*	**10**

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