U.S.N.										

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

Autonomous Institute Affiliated to VTU

July 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 22CV5PCHIE **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.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Using the Engineering's representation, explain the occurrence and movement of water on the Earth.	*CO 1*	*PO 1*	**6**
	b)		A watershed has 5 rain gauge stations. In a year, the annual rainfall recorded by the gauges are as follows: Station: KA01, KA02, KA03, KA04, KA05, KA06 Rainfall (cm): 82.6, 102.9, 180.3, 110.3, 98.8, 136.7 (i) Determine the standard error in the estimation of mean rainfall in the existing set of rain gauges. (ii) For 10% error in estimation of mean rainfall, calculate the optimum number of rain gauge stations in the watershed.	*CO 1*	*PO 1*	**8**
	c)		For the rain gauge station Chitradurga, calculate the missing rainfall data K for the month of July'83. Rainfall data for the surrounding three stations Shimoga, Hassan and Chikkamagaluru are available as follows: Year: Chitradurga, Shimoga, Hassan, Chikkamagaluru Normal Annual rainfall (cm): 26.2, 35, 28.7, 30.2 July' 83 Rainfall (cm): K, 14.9, 94.9, 13.1	*CO 1*	*PO 1*	**6**
			OR			
2	a)		Discuss various weather systems of precipitation in the Indian context.	*CO 1*	*PO 1*	**5**
	b)		With appropriate example, explain the term return period and its relevance in hydrology.	*CO 1*	*PO 1*	**5**
	c)		A catchment area is pentagonal in shape comprising a square ABCD with sides of 16 km and an equilateral triangle ADE. Rain gauges A, B, C, D, and E are positioned at the corners of the catchment, while another gauge, F, is at the center of the square. Over the course of a year, rainfall measurements were recorded as follows: 10 cm at station A, 15 cm at station B, 8 cm at station C, 6 cm at station D, 9 cm at station E, and	*CO 1*	*PO 2*	**10**

		12 cm at station F. Using the Thiessen polygon method, determine the average rainfall over the entire catchment.			
		UNIT - II			
3	a)	List the factors affecting evapotranspiration.	***CO 1***	***PO 1***	**4**
	b)	The KRS reservoir in Mysore had an average surface area of 20 km^2 during June 2022. In that month the following data were observed. Mean rate of inflow = 10 m^3/s, outflow = 15 m^3/s, monthly rainfall = 10 cm and decline in storage = 16 million m^3. Assuming the seepage losses to be 1.8 cm, estimate the reservoir evaporation in that month.	***CO 1***	***PO 1***	**6**
	c)	A storm with 150 mm precipitation produced a direct runoff of 8.7 cm with incremental hourly rainfall values being 0.6, 1.35, 2.25, 3.45, 2.7, 2.4, 1.5 and 0.75 cm/hr. Estimate the ϕ-index of the storm.	***CO 1***	***PO 2***	**10**
		UNIT - III			
4	a)	List the methods available for measuring the stage and discharge in a river. With a neat sketch explain the slope-area method.	***CO 1***	***PO 1***	**8**
	b)	During a flood flow, the depth of water in a 10 m wide rectangular channel was found to be 3.0 m and 2.9 m at two sections 200 m apart. The drop in the water-surface elevation was found to be 0.12 m. Assuming Manning's coefficient to be 0.025, estimate the flood discharge through the channel.	***CO 1***	***PO 2***	**12**
		OR			
5	a)	Explain basic assumptions constituting unit hydrograph theory.	***CO 1***	***PO 1***	**8**
	b)	Following are the ordinates of a storm hydrograph of a river draining a catchment area of 423 km^2 due to a 6 hr isolated storm. Derive the ordinates of a 6-hr unit hydrograph for the catchment.	***CO 1***	***PO 2***	**12**

Time from the start of storm (hr)	-6	0	6	12	18	24	30	36	42	48
Discharge (m^3/s)	10	10	30	87.5	115.5	102.5	85	71	59	47.5

Time from the start of storm (hr)	54	60	66	72	78	84	90	96	102
Discharge (m^3/s)	39	31.5	26	21.5	17.5	15	12.5	12	12

		UNIT - IV			
6	a)	Explain crop seasons in the Indian context.	***CO 2***	***PO 1***	**4**
	b)	Explain with neat sketches, any two techniques of water distribution in the farm.	***CO 2***	***PO 1***	**8**
	c)	Determine the field capacity of a soil for the given data: Depth of root zone = 1.8 m, existing moisture = 8 %, dry density of the soil = 1450 kg/m^3, quantity of water applied to the soil = 650 m^3, water loss due to the deep percolation and evaporation = 10%, and area to be irrigated = 1000 m^2.	***CO 2***	***PO 1***	**8**

			UNIT - V			
	7	a)	Explain the following terms (i) Kor water depth (ii) paleo irrigation (iii) time factor (iv) field capacity and (v) duty of irrigation water.	***CO** 2*	***PO** 1*	**10**
		b)	Gross command area for a distributary is 20000 ha, 75% of which can be irrigated. The intensity of irrigation for rabi season is 40% and that for kharif season is 10%. Kor period is 4 weeks for the rabi crop and 2.5 weeks for the kharif crop. Outlet factors for the rabi and kharif crops may be assumed as 1800 ha/ cumec and 775 ha/ cumec, respectively. Determine (i) the outlet discharge and (ii) delta for each crop.	***CO** 2*	***PO** 2*	**10**

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