GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2024

Subject Code:3144005   **Date:22-11-2024**

Subject Name:Water Resource Engineering & Hydrology

Time:02:30 PM TO 05:00 PM   **Total Marks:70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Write a short note on cyclones and anticyclones.	**03**
	(b)	Describe the principal of rainfall measurement using a Radar with neat sketch.	**04**
	(c)	The cumulative rainfall depth with time during a storm as obtained from a recording rain gauge at a station is as:	**07**

Time [in hour]	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00
Cumm. Rainfall [mm]	0	6	11	16	24	38	51	57	66

        (i) Construct the hyetograph of this storm using uniform time interval of 30-minutes.

        (ii) Compute the maximum average rainfall intensities for durations of 30-minutes and 1-hour.

Q.2	**(a)**	Discuss various methods of reducing evaporation from a water body.	**03**
	(b)	Estimate the evaporation from a free water surface on 18-September using Penman's equation: Air temperature 20°C, Air vapor pressure 15.0mm of mercury, Sunshine hours 6.0 hr, Atmospheric pressure 755mm of mercury, Wind velocity 1.8m/s at 2.0m above ground level.	**04**
	(c)	Explain the working of double ring infiltrometer with adjustable depth of flooding. Describe how infiltration capacity rate can be measured using a double ring infiltrometer.	**07**

OR

	(c)	The constant base flow of 30 cumec is derived from a storm of 3 hours. Derive the ordinates of 3-hour unit hydrograph using the data of flow given in below table. The area of the drainage basin of the stream is 400 sq.km.	**07**

Sep 3		Sep 4		Sep 5		Sep 6	
Time	Flow (cumec)	Time	Flow (cumec)	Time	Flow (cumec)	Time	Flow (cumec)
3 AM	130	3 AM	110	3 AM	150	3 AM	30
9 AM	20	9 AM	90	9 AM	170	9 AM	40
3 PM	180	3 PM	95	3 PM	250	3 PM	25
9 PM	210	9 PM	105	9 PM	210	9 PM	35

Q.3 **(a)** Distinguish between Surface runoff, Sub-surface runoff, and Baseflow. **03**
(b) Describe the step-by-step procedure of the derivation of a unit hydrograph from an isolated storm. **04**
(c) Consider the following rainfall: 20, 35, 60, 22, 30 and 12 mm/hr for the successive 1-hour period of a 6 hour's storm. The corresponding surface runoff is estimated of 40 mm/hr. Calculate Ø-index. Also determine W-index. **07**

OR

Q.3 **(a)** Explain the terms, (i) Cone of depression, (ii) Radius of influence, and (iii) Drawdown for groundwater well. **03**
(b) Explain, how the yield of an open well can be determined using recuperation test for groundwater exploration. **04**
(c) Explain with sketch the Unconfined Aquifer. In which hydro-geological conditions unconfined aquifers are often found? **07**

Q.4 **(a)** Draw the uplift pressure diagram for concrete gravity dam. **03**
(b) How can you estimate areal rainfall in the absence of standard rain-gauges? **04**
(c) How the rainfall over a drainage basin is measured using Isohyetal method? explain with sketch. **07**

OR

Q.4 **(a)** What are the different types of spillways? **03**
(b) Classify dams based on the structural behavior. Explain any two of them with neat sketches. **04**
(c) Explain the procedure to fix the reservoir capacity with the help of mass curves of inflow and outflow. Consider suitable assumptions. **07**

Q.5 **(a)** What are the drawbacks of using Lacey's theory for designing the unlined irrigation channel? **03**
(b) How will you select the design return period of a flood event? What precautions are to be taken in the selection process? **04**
(c) Design an unlined irrigation channel passing through alluvial soil plain using Kennedy's theory of canal design. Given are full supply discharge FSQ=13.50 Cumec, longitudinal slope S=1/4500, Manning's constant N=0.0230, velocity ratio m=1, side slope z=0.45. **07**

OR

Q.5 **(a)** Explain causes and effects of drought. **03**
(b) Discuss principles and objectives of water resources planning. **04**
(c) Design an unlined irrigation channel in alluvial soil using Lacey's theory for full supply discharge (FSQ) is 13.50 Cumec, longitudinal slope S=1/4500, Manning's constant N=0.0230, velocity ratio m=1, side slope z=0.45. **07**

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