GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2023

Subject Code:3144005   **Date:13-07-2023**
Subject Name:Water Resource Engineering & Hydrology
Time:10:30 AM TO 01:00 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)**	Define: Confined aquifer, Base period, Duty.	**03**
	(b)	Describe with sketch canal syphon provided to cross the river.	**04**
	(c)	What are the applications of Unit Hydrograph?	**07**

The observed flows from a storm of 4 hours duration on a stream are as given below:

Date	Time	Flow (cumec)	Date	Time	Flow (cumec)
Aug 7	0 AM	20	Aug 9	0 AM	96
	6 AM	118		6 AM	78
	12 PM	265		12 PM	62
	6 PM	296		6 PM	55
Aug 8	0 AM	243	Aug 10	0 AM	48
	6 AM	198		6 AM	42
	12 PM	154		12 PM	36
	6 PM	125		6 PM	20

Assuming a constant base flow of 20 cumec, derive ordinates of 4-hour unit hydrograph. The area of the drainage basin of the stream is 380 sq.km.

Q.2	**(a)**	Define: Ridge canal, Gross Command Area, Highest Flood Level.	**03**
	(b)	Discuss causes and preventive measures of water logging.	**04**
	(c)	Briefly describe: Net rainfall, Ø-index, W-index.	**07**

The rate of rainfall for the successive 30 min period of 3 hours storm are: 18, 36, 53, 28, 24 and 10 mm/hr. The corresponding surface runoff is estimated about 38 mm/hr. Establish the Ø-index and W-index.

OR

	(c)	Briefly describe: Field-capacity, Permanent wilting point, Time factor.	**07**

The gross commanded area for an irrigation canal is 25000 hectares, out of which 78% is culturable commanded area. The intensity of irrigation is 40% for rabi and 10% of kharif crops. If kor period of 4 weeks for rabi and 2.5 weeks for kharif crops, determine the outlet discharge. Outlet factors for rabi and kharif crops may be assumed as 2000 hectares/cumec and 800 hectares/cumec respectively. Also, calculate delta for each case.

Q.3	(a)	Briefly describe properties of aquifer.	03
	(b)	Discuss with sketch Field permeability – pumping out test for steady radial flow to well in unconfined aquifer and derive the relationship for 'k' as per Dupuit's theory.	04
	(c)	Design an irrigation channel for following data using Lacey's theory. Q = 22 cumec & Silt factor = 1.1.	07

OR

Q.3	(a)	Define for canals: Critical velocity, Regime channel, Economical section.	03
	(b)	Give detailed comparison between Kennedy's theory and Lacey's theory.	04
	(c)	Design an irrigation channel to carry a discharge of 32 cumec by Kennedy's theory. Take B/D ratio as 8.0, N=0.025 & m=1.	07

Q.4	(a)	Define: Canal fall, Weir, Barrage.	03
	(b)	Discuss the limitations of Bligh's creep theory.	04
	(c)	Draw the sketch of layout of the diversion head work and show all components. Briefly discuss the functions of these components.	07

OR

Q.4	(a)	Define: Gravity dam, Spillway, Sluice way.	03
	(b)	Draw detailed sketches showing all components of cross drainage works for the canals: (i) Aqueduct and (ii) Level crossing.	04
	(c)	Explain with sketches different types of loads acting on Gravity dam. Also, discuss multiple step method of design of Gravity dam.	07

Q.5	(a)	Draw a detailed C/S sketch showing all components of zone-based embankment dam.	03
	(b)	What is flood routing? Discuss any one method of it.	04
	(c)	Explain with sketches different types of failures of earthen dams.	07

OR

Q.5	(a)	Define: Full reservoir level, Dead storage level, Reservoir yield.	03
	(b)	Describe causes and control measures of reservoir sedimentation.	04
	(c)	Explain with sketches determination of reservoir capacity required to produce a specific yield using a mass curve.	07

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