Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI EXAMINATION – WINTER 2025

Subject Code: 3160610 Date: 02-12-2025

Subject Name: Water Resources Engineering and 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)**	Discuss methods adopted to separate the base flow.	**03**
	(b)	List out automatic rain gauges. Explain any one in detail with a neat sketch.	**04**
	(c)	A catchment has four rain gauge stations, with their normal precipitation as 850, 500, 450 and 360 mm respectively. Determine the optimum number of rain gauges in the catchment, if it is desired to limit the error in the mean value of rainfall in the catchment to 12%	**07**
Q.2	**(a)**	Define unit hydrograph. Write down the assumptions of unit hydrograph theory.	**03**
	(b)	Explain how the characteristics of drainage basin affect runoff.	**04**
	(c)	A 6 hr unit hydrograph for a basin has the following ordinates:	**07**

Time (hrs)	0	6	12	18	24	30	36	42
6 hr U.H.O. (m^3/s)	0	20	55	160	130	90	70	60
Time (hrs)	48	54	60	66				
6 hr U.H.O. (m^3/s)	30	20	10	0				

Determine the ordinates of 12 hr unit hydrograph. Use S-curve method.

OR

(c) The ordinates of 3 hr Unit hydrograph are given below : **07**

Time in hrs	0	3	6	9	12	15	18	21
Ordinates (cumecs)	0	12	26	30	22	16	12	9
Time in hrs	24	27	30					
Ordinates (cumecs)	5	3	0					

Find the ordinates of a 6 hr UH analytically. Also, sketch 6 hr – Unit hydrograph.

Q.3 **(a)** Write down classification of dams. **03**

(b) Discuss briefly drought contingency planning. **04**

(c) Explain in brief classification of hydropower plants based on storage characteristics and based on head. **07**

OR

Q.3 **(a)** List out causes of floods and explain any one cause of flood in detail. **03**

(b) Explain drought. Also explain causes of drought. **04**

(c) Draw a neat sketch of 'Hydroelectric power plant'. Explain each component briefly. **07**

Q.4 **(a)** Define: Aquiclude, Aquifuge and Aquitard. **03**

(b) Discuss with a neat sketch, the various storage zones of reservoir. **04**

(c) Derive an expression for discharge from a well fully penetrating a confined aquifer. **07**

OR

Q.4 **(a)** Define: Specific yield, Specific retention and transmissibility. **03**

(b) Explain measure to reduce evaporation losses from reservoir. **04**

(c) Explain Recuperation test to estimate the safe yield of an open well. **07**

Q.5 **(a)** Write a note on Flood walls. **03**

(b) Explain Roof top rain water harvesting with neat sketch. **04**

(c) Discuss the recharge to ground water method of rain water harvesting. **07**

OR

Q.5 **(a)** Write a note on Levees. **03**

(b) Discuss water conservation measures. **04**

(c) Describe various environmental consequences of water-resource projects. **07**

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Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI (NEW) EXAMINATION – WINTER 2024

Subject Code:3160610 Date:20-11-2024

Subject Name:Water Resources Engineering and 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 brief note on gravity dam with its salient features.	**03**
	(b)	Differentiate between unconfined and confined aquifer.	**04**
	(c)	Discuss various measures are adopted for water conservation.	**07**
Q.2	**(a)**	What is S-hydrograph? Also give its uses.	**03**
	(b)	Explain various effects of draught.	**04**
	(c)	Discuss various methods of direct measurement of consumptive use of water.	**07**
		OR	
	(c)	Define term 'flood routing'. Discuss Muskingum's method for channel routing.	**07**
Q.3	**(a)**	Define following terms: Storage co-efficient (2) Aquifuge (3) Specific retention	**03**
	(b)	Discuss non-automatic type of rain gauge	**04**
	(c)	What is runoff? Also discuss various factors affecting runoff from catchment area.	**07**
		OR	
Q.3	**(a)**	State Darcy's law. What are its limitations?	**03**
	(b)	Discuss various physiographic factors affecting shape of hydrograph.	**04**
	(c)	Define spillway and describe various bucket-type energy dissipaters.	**07**
Q.4	**(a)**	Write brief note on reservoir losses.	**03**
	(b)	Classify hydropower plant based on storage characteristics	**04**
	(c)	The direct runoff hygrograph (DRH) resulting from 5.0 cm effective rainfall of 6-hr duration is given below. Determine catchment area and ordinates of 6-hr unit hydrograph.	**07**

Time (Hour)	0	6	12	18	24	30	36
DR Ordinate (m^3/s)	0	20	170	325	365	315	235

Time (Hour)	42	48	54	60	66	72
DR Ordinate (m^3/s)	160	100	65	35	15	0

OR

Q.4	**(a)**	Enumerate limitations of unit hydrograph theory.	**03**
	(b)	Explain following terms: (1) Density currents (2) Trap efficiency	**04**
	(c)	Derive an expression for discharge in form of drawdown from well fully penetrating an unconfined aquifer.	**07**
Q.5	**(a)**	Write functions of following components of hydropower plant. Penstocks (2) Surge tank (3) Draft tube	**03**
	(b)	Describe double ring infiltrometer to determine rate of infiltration.	**04**
	(c)	What is transpiration? Discuss factors affecting it and phytometer method to measure rate of transpiration.	**07**

OR

Q.5	**(a)**	Discuss levees as flood control measure.	**03**
	(b)	Explain procedure of separating base flow in hydrograph.	**04**
	(c)	Discuss functional requirements of water resources projects.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – WINTER 2023

Subject Code:3160610 Date:02-12-2023

Subject Name:Water Resources Engineering and 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)**	Define the following terms. (1) Hydrology,(2) Precipitation,(3) Flood	**03**
	(b)	Give difference between gravity dam and earthen dam.	**04**
	(c)	Explain the hydrological cycle with its applications and also draw the neat sketch.	**07**
Q.2	**(a)**	Explain the factors affecting Evaporation.	**03**
	(b)	Define drought and explain any two types of drought.	**04**
	(c)	For a storm of 2-hrs durations, the rainfall intensity is as follows. If the ω-index is 3 cm/hr. Find out the surface runoff and W-index.	**07**

Time period (min)	20	20	20	20	20	20
Rainfall intensity (cm/hr)	2.6	2.5	10.2	7.8	5.2	2.0

OR

	(c)	In a certain river basin, there are five rain gauges stations, with their normal precipitations amounting to 810,420,540,380 and 1000 mm respectively. Determine the optimum numbers of rain gauge in the catchment required. Take, error in the man value of rainfall is 12%.	**07**
Q.3	**(a)**	Explain the assumptions to be taken for Unit Hydrograph Theory.	**03**
	(b)	Give the difference between confined and unconfined aquifer with neat sketches.	**04**
	(c)	The ordinates of 3-hr unit hydrograph are as per given table. Compute the ordinate of 6-hours unit hydrograph.	**07**

Time (hr)	0	3	6	9	12	15	18	21	24	27	30	33
Unit hydrograph (cumec)	0	20	50	150	120	90	70	50	30	20	10	0

OR

Q.3	**(a)**	Define the following terms. (1) Ground water, (2) Dam, (3) Reservoir.	**03**
	(b)	Write the short note on S-hydrograph.	**04**
	(c)	Water was pumped out from a well in a confined aquifer 10 m thick, having a hydraulic conductivity of 1.5 m/day. The drawdown observed in the two adjoining wells at 10m and 50 m from the pumping well was 3.2 m and 0.08 m respectively. Find the constant rate of pumping.	**07**

Q.4	**(a)**	Write short note on Reservoir sedimentation.	**03**
	(b)	Explain different forms of precipitation in brief.	**04**
	(c)	Explain with neat sketch storage zone of reservoir.	**07**
		OR	
Q.4	**(a)**	Give difference between hyetograph and hydrograph.	**03**
	(b)	Classify the hydro power plants. Explain any one in detail.	**04**
	(c)	Discuss the environment impact of multipurpose water resources projects.	**07**
Q.5	**(a)**	Write short note on Flood proofing and Flood forecasting.	**03**
	(b)	Explain flood frequency analysis.	**04**
	(c)	Explain the Darcy's law. Discuss its limitations and validity.	**07**
		OR	
Q.5	**(a)**	Explain flood routing through reservoir.	**03**
	(b)	Write short note on "Water harvesting system".	**04**
	(c)	Explain theoretical probability distribution Gumbel's method.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI(NEW) EXAMINATION – WINTER 2022

Subject Code:3160610 Date:13-12-2022

Subject Name:Water Resources Engineering and 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.**

Q.1 **(a)** Explain the terms (i) Infiltration capacity (ii) Infiltration rate (iii) Rainfall excess **03**

(b) What is evaporation? Mention the factors affecting evaporation. **04**

(c) List various methods of calculating average rainfall over area and explain Isohyetal method. **07**

Q.2 **(a)** Define (i) Direct runoff hydrograph (ii) Unit hydrograph (iii) S-hydrograph **03**

(b) Explain mass curve? Explain how mass curve is prepared ? **04**

(c) A rain gauge recorded the following accumulated rainfall during the storm. Draw the mass rainfall curve and the hyetograph. **07**

Time (A.M.)	10.00	10.15	10.30	10.45	11.00	11.15	11.30	11.45	12.00
Accumulated rain fall (mm)	0.0	8.5	16	27	37	48	62	80	90

OR

(c) A peak of flood hydrograph due to 6 hr storm is 470 m^3/s. The average depth of rainfall is 8 cms. Assume an infiltration loss of 0.25 cm/hour and a constant base flow of 15 m^3/sec. Estimate the peak discharge of 6-hour unit for this catchment. **07**

Q.3 **(a)** Explain with a neat sketch, occurance of ground water at various location below the earth surface. **03**

(b) Explain Darcy's law and what are its limitation? **04**

(c) During the recuperation test of a 4.0 m open wee a recuperation of the depression head from 2.5 m to 1.25 m was found to take place in 90 minutes. Determine specific capacity per unit well area. Also determine yield of well for safe drawdown of 2.5 m. **07**

OR

Q.3 **(a)** Define (i) porosity (ii) specific retention (iii) specific yield **03**

(b) Distinguish between permeability and transmissibility of soil **04**

(c) Design an open well in fine sand to give a discharge of 0.03 cumec when worked under a depression head of 2.5 m. **07**

Q.4 **(a)** Define (i) safe yield (ii) secondary yield (iii) design yield. **03**

(b) Explain measure to reduce evaporation losses from reservoir. **04**

(c) Explain with neat sketch storage zones of reservoir **07**

OR

Q.4	**(a)**	Define (i) Trap efficiency (ii) Density currents (iii) capacity- inflow ratio	**03**
	(b)	Discuss in details factors affecting selection of dam type?	**04**
	(c)	What are the various causes for the reservoir sedimentation and how would you reduce the rate od sedimentation?	**07**
Q.5	**(a)**	Define flood routing. What are the uses of flood routing?	**03**
	(b)	Explain roof top water harvesting method	**04**
	(c)	Explain various causes of flood	**07**

OR

Q.5	**(a)**	What is artificial ground water recharge explain any two methods	**03**
	(b)	Give the functional requirements of a multi – purpose projects	**04**
	(c)	Explain drought and causes of drought	**07**

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