Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI EXAMINATION – SUMMER 2025

Subject Code: 3160610 Date:20-05-2025

Subject Name: Water Resources Engineering and 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)**	Write brief note on any one dam located in Gujarat state.	**03**
	(b)	Define following terms: Aquifer (2) Aquiclude (3) Aquifuge & (4) Aquitard	**04**
	(c)	State Dalton's Law of evaporation. Explain various methods adopted to evaluate rate of evaporation.	**07**
Q.2	**(a)**	Describe various forms of precipitation.	**03**
	(b)	Discuss various causes of flood.	**04**
	(c)	Explain method of determining direct runoff from a given storm hydrograph.	**07**
		OR	
	(c)	A storm with 12 cm precipitation produces a direct surface runoff of 7.2 cm. The time duration of the storm is given in below table. Determine Ø – index of the storm.	**07**

Time (Hour)	1	2	3	4	5	6	7	8
Hourly rainfall (cm)	0.4	1.0	1.8	2.6	2.0	1.5	1.2	0.5

Q.3	**(a)**	Write brief note on gravity dam with its salient features	**03**
	(b)	Describe various methods to find out missing rainfall data.	**04**
	(c)	Discuss recuperation test to estimate safe yield of an open well	**07**
		OR	
Q.3	**(a)**	Discuss briefly isohyetal method to determine average depth of precipitation.	**03**
	(b)	Discuss briefly any four drainage basin characteristics.	**04**
	(c)	Discuss various types of energy dissipation devices used below spillway	**07**
Q.4	**(a)**	Explain assumptions of unit hydrograph theory.	**03**
	(b)	Enumerate principles and objectives of water resources planning	**04**
	(c)	What is runoff? Discuss various factors affecting runoff from catchment area.	**07**
		OR	
Q.4	**(a)**	Differentiate Hydrograph and Hyetograph.	**03**
	(b)	What is S-hydrograph? What are its uses?	**04**
	(c)	Explain the procedure of determine capacity of reservoir using mass curve method.	**07**
Q.5	**(a)**	Write short note on run-off enhancement.	**03**
	(b)	Classify hydropower plant based on head of water and plant capacity.	**04**
	(c)	Explain various non-structural mitigation measures are adopted to control flood.	**07**
		OR	
Q.5	**(a)**	Define and classify draught.	**03**
	(b)	Discuss channel improvement works as flood control measure.	**04**
	(c)	Enumerate various water resources projects effects on environment and ecological balance.	**07**

****

Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3160610 Date:15-05-2024

Subject Name:Water Resources Engineering and 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: Hyetograph, infiltration, Runoff	**03**
	(b)	Explain (1) Thiessen polygon method (2) Isohyetal method, to find average depth of rainfall.	**04**
	(c)	Enlist recording and non-recording type of rain gauges. Explain any one non-recording type of rain gauge with a neat sketch.	**07**
Q.2	**(a)**	Define: Drainage basin, Drainage density, Stream density	**03**
	(b)	Write down the assumptions and limitations of unit hydrograph theory.	**04**
	(c)	The direct runoff hydrograph resulting from a 6.0 cm effective rainfall of 6 hr duration is given below. Determine the area of the catchment and the ordinates of the 6 hr unit hydrograph. Also sketch 6 hr unit hydrograph.	**07**

Time (hrs)	00	06	12	18	24	30	36	42	48
Direct runoff (m^3/s)	00	30	170	315	360	300	240	170	120
Time (hrs)	54	60	66	72					
Direct runoff (m^3/s)	70	30	10	00					

OR

	(c)	Find the ordinates of a storm hydrograph resulting from a 3 hours storm with rainfalls of 2.45, 7.20 and 4.25 cm during subsequent 3 hours intervals. The ordinates of unit hydrograph(O.U.H.) are given below:								**07**

Time (hrs)	03	06	09	12	15	18	21	24	03	06
O.U.H. (cumecs)	0	115	340	530	370	320	260	225	175	130
Time (hrs)	09	12	15	18	21	24				
O.U.H. (cumecs)	80	65	50	30	15	0				

Assume an initial loss of 5 mm, infiltration index 2.55 mm/hour and base flow of 30 cumecs.

Q.3	**(a)**	Explain types of sediment load.	**03**
	(b)	Explain Darcy's law with its limitation?	**04**

	(c)	An unconfined aquifer has a thickness of 40 m. A fully penetrating 25 cm diameter well in this aquifer is pumped at a rate of 30 lit/s. The drawdown measured in two observation wells located at distances of 10 m and 120 m from the well are 8 m and 0.75 m respectively. Determine the average hydraulic conductivity of the aquifer. At what distance from the well the drawdown is insignificant.	**07**

OR

Q.3	**(a)**	List out the causes of sedimentation in reservoir and explain any two.	**03**
	(b)	Differentiate between Confined aquifer and Unconfined aquifer.	**04**
	(c)	A well 0.7 m in diameter penetrates fully a confined aquifer of thickness 30 m, having a conductivity of 1.5 m/day. It is expected that the drawdown in the well be limited to 2.75 m. Assuming that the radius of influence is 330 m, find the maximum discharge that can be pumped out of well.	**07**
Q.4	**(a)**	Distinguish between Gravity dam and Earth dam.	**03**
	(b)	Write a note on flood routing.	**04**
	(c)	Enlist different types of reservoirs. Explain each in brief.	**07**

OR

Q.4	**(a)**	Explain dams based upon their function.	**03**
	(b)	Explain flood frequency analysis.	**04**
	(c)	Explain the mass curve method to determine reservoir capacity.	**07**
Q.5	**(a)**	Explain classification of hydropower plant based on head.	**03**
	(b)	Write a note on check dam.	**04**
	(c)	What is the need for planning of water resources projects? Discuss the steps involved in the water resources planning.	**07**

OR

Q.5	**(a)**	Explain: Penstocks, Surge tank, Turbines	**03**
	(b)	Explain types of drought.	**04**
	(c)	Explain roof top rain water harvesting method with a neat sketch.	**07**

****

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3160610 Date:04-07-2023

Subject Name:Water Resources Engineering and 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)**	What are applications of hydrology?	**03**
	(b)	Differentiate between hyetograph and hydrograph	**04**
	(c)	State Dalton's law of evaporation. Also Discuss various factors affecting rate of evaporation.	**07**
Q.2	**(a)**	Give essential requirements of spillway.	**03**
	(b)	Explain procedure of separating base flow in a given hydrograph.	**04**
	(c)	Discuss various methods to determine rate of runoff.	**07**
		OR	
	(c)	An artesian tube well has a diameter of 30 cm. A thickness of aquifer is 40 meter and its permeability is 45 m/day. Find the yield of tube well under a drawdown of 3 meter at a well face. Use radius of influence as recommended by Sichardt.	**07**
Q.3	**(a)**	State Darcy's low of flow of water through soil along with assumptions made in its derivation.	**03**
	(b)	How infiltration capacity of soil can be measured in field?	**04**
	(c)	The ordinates of storm hydrograph for a drainage basin in response to a 6-hour storm are observed as follow:	**07**

Time (Hour)	0	3	6	9	12	15	18	21
Ordinate (cumec)	15	35	65	105	150	175	195	155

Time (Hour)	24	27	30	33	36	39	42	45
Ordinate (cumec)	140	115	85	65	45	30	25	15

Consider total rainfall of 9.5 cm during storm, average rate of infiltration loss is 0.75 cm/hour and constant baseflow of 15 cumec. Derive ordinates of 6-hour unit hydrograph and area of basin.

OR

Q.3	**(a)**	What are adverse effects of flood?	**03**
	(b)	Write a short note on Thiessen's polygon method of calculating average rainfall over area.	**04**
	(c)	Discuss various structural measures to mitigate flood disaster.	**07**

Q.4	**(a)**	Explain need for conservation of water.	**03**
	(b)	Discuss briefly various purposes to plan water resources development projects in India.	**04**
	(c)	Define reservoir routing. Describe Modified Pul's & Goodrich method for reservoir routing.	**07**

OR

Q.4	**(a)**	Give requirements of water resources planning.	**03**
	(b)	Define following parameters of ground water hydrology. (1) Specific capacity of well (2) Specific retention (3) Co-efficient of transmissibility (4) Well losses	**04**
	(c)	Describe briefly reservoir losses. Also gives measures are adopted to reduce evaporation losses from reservoir.	**07**

Q.5	**(a)**	Write a brief note on gravity dam.	**03**
	(b)	Classify hydroelectric power plants based on storage characteristics in detail.	**04**
	(c)	Discuss various water conservation measures.	**07**

OR

Q.5	**(a)**	Write a brief note on flow duration curve.	**03**
	(b)	Describe briefly various effects of drought.	**04**
	(c)	Write various steps involved in planning of water resources development projects.	**07**

****

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3160610 Date:01/06/2022

Subject Name:Water Resources Engineering and 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)**	Enlist the methods that are adopted to evaluate the rate of evaporation.	**03**
	(b)	Describe double mass curve technique to check consistency of rain gauge station data.	**04**
	(c)	There are four rain-gauge stations installed on certain river basin whose normal annual precipitations amounting to 850, 520, 430 and 370mm 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 15%.	**07**
Q.2	**(a)**	Explain the difference between Hyetograph and Hydrograph with sketch.	**03**
	(b)	Describe base flow separation methods with sketch.	**04**
	(c)	What do you mean by flow duration curve? And also mention its uses.	**07**
		OR	
	(c)	Define "Unit Hydrograph". Wright down the assumption made in unit hydrograph theory.	**07**
Q.3	**(a)**	Define:- Confined aquifer, specific yield and coefficient of transmissibility	**03**
	(b)	Describe constant level pumping test to found the yield of an open well.	**04**
	(c)	Explain groundwater occurrence with sketch and define various water bearing formation.	**07**
		OR	
Q.3	**(a)**	How will you carry out hydrological investigation for planning of reservoir?	**03**
	(b)	Elaborate trap efficiency. Explain different methods of control of reservoir sedimentation.	**04**
	(c)	What are various factors that affect the site selection of dam? Discuss them briefly.	**07**
Q.4	**(a)**	List out components of hydropower project also draw general layout of a hydropower plant.	**03**
	(b)	Write short note on Surge Tank	**04**
	(c)	Explain in brief classification of hydropower plants based on storage characteristics and based on head.	**07**

OR

Q.4	**(a)**	Explain levees with sketch	**03**
	(b)	Explain rational method of flood estimation.	**04**
	(c)	What return period you would adopt in the design of a culvert on a drain if you are allowed to accept only 20% risk of flooding in the 50 years of expected life of the culvert?	**07**
Q.5	**(a)**	Discuss various types of drought.	**03**
	(b)	Describe in detail with sketch the components of the roof top rainwater harvesting system.	**04**
	(c)	Explain "runoff enhancement".	**07**

OR

Q.5	**(a)**	What are the objectives of water resources planning?	**03**
	(b)	What are functional requirement of water resources planning?	**04**
	(c)	Describe various environmental consequences of water-resource projects.	**07**

****