Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3170621 Date:16-12-2024

Subject Name: Design of hydraulic structures

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.**

Q.1	**(a)**	Describe various factors affecting selection of suitable type of a dam.	**07**
	(b)	What is phreatic line? Explain its importance in an embankment dam. Explain graphical method of obtaining the phreatic line in an earthen dam.	**07**
Q.2	**(a)**	Describe various seepage failures and structural failures of an earthen dam and their remedies.	**07**
	(b)	Describe the procedure of selection of a suitable section for an earthen dam as per the available material.	**07**
		OR	
	(b)	How would you compute seepage force in the design of a gravity dam under various scenarios? Explain it.	**07**
Q.3	**(a)**	A section of gravity dam having 5.0 m top width and base width of 35m. The height of dam is 33m. It stores water up to height of 30m. Upstream face is vertical. Check the stability of dam against overturning and sliding with no drain available and no tension crack. Take friction factor = 0.7. Consider water pressure and uplift pressure only.	**14**
		OR	
Q.3	**(a)**	A homogeneous earth dam is 30m high and has a crest width of 5m. The upstream and downstream slopes are respectively 3:1(H:V)and 4:1(H:V). Compute seepage discharge through the dam and also compute ordinates of phreatic line and plot it graphically. Assume a free board of 3m and length of downstream horizontal filter as 30m. Take coefficient of permeability =1 x 10^{-6} m/s.	**14**
Q.4	**(a)**	Explain the design features of chute spillway.	**07**
	(b)	How would you calculate stability of downstream slope of an earthen dam. Explain its procedure. What is the severest condition for a downstream slope?	**07**
		OR	
Q.4	**(a)**	Write a short note on (1) Galleries in gravity dam (2) Foundation treatment in gravity dam.	**07**
	(b)	What is principal stress in a gravity dam? Derive expression of normal and shear stress in a gravity dam.	**07**
Q.5	**(a)**	Define stilling basin and its function. Describe design features of components of stilling basin.	**07**
	(b)	What is the necessity of energy dissipation work? Explain various types of energy dissipation works with figure.	**07**
		OR	
Q.5	**(a)**	Describe Swedish circle method for stability of slope analysis of an embankment dam.	**07**
	(b)	Explain ogee spillway. What is cavitation in ogee spillway and what are the causes? Its remedial measures suggest.	**07**

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