Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 3170621 Date:01-06-2024

Subject Name: Design of hydraulic structures

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)**	What is meant by a "dam and a reservoir".	**03**
	(b)	How the investigations for a dam site are done?	**04**
	(c)	What are the main types of sub-surface explorations? Explain what is their importance in a project of a dam?	**07**
Q.2	**(a)**	Define spillway and enlist types of spillway	**03**
	(b)	What are the advantages of gated spillway over non-gated spillway?	**04**
	(c)	Compute the discharge over an ogee shaped weir that's co-efficient of discharge is equal to 2.5 at a head of 4 meter. The length of the spillway is 40 meter. The weir crest is 6 meter above the bottom of the approach channel which has the same width as that of the spillway.	**07**
		OR	
	(c)	A homogeneous earth dam is 43 meter high. The free-board provided is 3 meter. A 30 meter long horizontal filter is also provided on the downstream end. A flownet was drain for the dam section. The flownet comprised 5 flow channels and 15 potential drops. If the permeability of the material in the dam 3×10^{-5} meter/second. Calculate the seepage flow per meter length of the earth dam. If the dam is 500 meter long. Calculate the total discharge through the body of the dams.	**07**
Q.3	**(a)**	Explain the principles on which design of a gravity dam is based.	**03**
	(b)	Differentiate between elementary and practical profile of a gravity dam.	**04**
	(c)	Write a short note on galleries in dam.	**07**
		OR	
Q.3	**(a)**	What are construction and contraction joints in dams?	**03**
	(b)	What are the causes of failure of a gravity dam?	**04**
	(c)	Write a brief note on the necessity and methods of foundation treatments of gravity dam.	**07**
Q.4	**(a)**	Explain the design principle for earthen dam in shortly.	**03**
	(b)	Explain significance of phreatic line in an earthen dam.	**04**
	(c)	What precautions and remedial measures would you undertake to control the "seepage" through earthen dam body and through the dam foundation?	**07**

OR

Q.4	**(a)**	Enlist types of earthen dams with their sketches.	**03**
	(b)	What are rockfill dam and how it is more advantageous over earthen dam?	**04**
	(c)	What are the various causes of failure of earthen dam? Draw sketches to illustrate the answers.	**07**
Q.5	**(a)**	Why it is necessary to protect the stream bed below spillway?	**03**
	(b)	What is stilling basin? And when it is used?	**04**
	(c)	Explain the functional and technical difference between roller bucket and ski jump bucket with sketch.	**07**

OR

Q.5	**(a)**	What is hydraulic jump?	**03**
	(b)	What is arch dam and when it is selected?	**04**
	(c)	For a preliminary design of a concrete gravity dam below data is given: 1) Dam assumed to be of triangular section 2) Base width of dam is 40 meters and top width is zero meter. 3) Height of dam is 60 meters and no freeboard is provided 4) Horizontal earthquake acceleration of the foundation upstream is equal to 0.1g. 5) Specific gravity of concrete used in dam is 2.4 6) "Ce" co-efficient used for horizontal hydrodynamic pressure is 0.7 Calculate 1) Horizontal earthquake force due to inertia of dam material 2) Horizontal earthquake force due to inertia of the reservoir water	**07**

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