Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER- VII EXAMINATION-SUMMER 2023

Subject Code: 3170621 Date: 19/06/2023

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**

			MARKS
Q.1	**(a)**	How do you classify dam according to their use?	**03**
	(b)	Enlist the factors which are considered in the selection of the site of proposed dam	**04**
	(c)	What are the different materials that are commonly used for dam construction and what are their comparative advantages and disadvantages?	**07**
Q.2	**(a)**	What is the stilling basins and where it is used?	**03**
	(b)	What is meant by an energy dissipater? Why it is important in hydraulic structure?	**04**
	(c)	Explain briefly energy dissipation by hydraulic jump in hydraulic structures.	**07**
		OR	
	(c)	Explain briefly all bucket type energy dissipaters with sketch.	**07**
Q.3	**(a)**	What is meant by gravity dams?	**03**
	(b)	What are the advantages and disadvantages of gravity dam over the other type?	**04**
	(c)	A trapezoidal gravity dam is 10 meter high. It has a top width of 1 meter and base width of 9 meter. The upstream face or front face is vertical. Assume that water is stored upto the top of the dam. There is no free board. Weight of concrete is 24 KN/cubic meter and density of water is 10 KN/cubic meter. Consider only self weight of dam and reservoir water pressure is acting on dam. Neglect all other forces. 1) Calculate compressive stresses at toe and heel for the dam 2) Calculate factor safety against overturning in dam.	**07**
		OR	
Q.3	**(a)**	What do you mean by elementary profile of a gravity dam?	**03**
	(b)	Briefly explain the function of drainage gallery in gravity dam?	**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**

Q.4 **(a)** What are "earthen dams" and under what circumstances are they preferred? **03**

(b) Define and explain the term "phreatic line" in earthen dam with sketch. **04**

(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**

OR

Q.4 **(a)** Enlist the methods of construction used for constructing earthen dam? **03**

(b) Enlist and explain the type of earthen dams. **04**

(c) An earthen dam has following dimensions: **07**

1) Base width B = 75 meter.
2) Top width T = 6 meter
3) Depth of water stored in reservoir h = 12 meter
4) Free-board = 3 meter
5) Depth of pervious foundation = 30 meter.
6) Co-efficient of permeability of foundation material K = 3 cm/minute.

It is proposed to reduce seepage through the foundation by 80 percent of original value. Compute the length of an impervious upstream blanket required. Neglect seepage through blanket.

Q.5 **(a)** Differentiate between high gravity dam and low gravity dam. **03**

(b) Compute the discharge over an ogee shaped weir where co-efficient of discharge is equal to 2.5 at a head of 4 meter. The length of 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. **04**

(c) What are the various causes of failure of earth dam? Draw sketches to illustrate the answers. **07**

OR

Q.5 **(a)** What is the spillway and why it necessary in dam. **03**

(b) What are the merits and demerits of gated spillway upon non-gated spillway? **04**

(c) Enlist the various type of spillway with its sketches and explain any one in detail. **07**

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