Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER–VIII • Remedial EXAMINATION – WINTER 2013

Subject Code: 180601 Date: 18/09/2013

Subject Name: Design of Hydraulic Structure

Time: 03:00 pm – 05:30 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Draw a neat layout of diversion head works and indicate the various components of the system. Briefly indicate the function of each component.	**07**
	(b)	Describe various modes of failure of a concrete gravity dam.	**07**
Q.2	**(a)**	What are the different kinds of spillways and how are they selected for individual conditions?	**07**
	(b)	A horizontal apron of 16 m length a sheet pile is provided at 12 m distance from the upstream end. The sheet pile is of 4 m depth. The weir on the floor stores water upon 3 m height. Calculate uplift pressures at both faces of the sheet pile just below the floor and also at lower end of the sheet pile.	**07**
		OR	
	(b)	What is meant by an energy dissipator ? Discuss the various methods used for energy dissipation below spillways.	**07**
Q.3	**(a)**	What is meant by the elementary profile of a gravity dam and how is it deduced ? What should be the maximum depth of elementary profile of a dam if the safe limit of stress on the masonry should not exceed 150 tones per m^2. Assume unit weight of masonry = 2.4	**07**
	(b)	A gravity dam is 10 m high. It has a top width of 1 m and base width 9 m. The front face is vertical. Assume that the weight of concrete is 2400 kg/m^3 and the water is stored up to the top of the dam. (Density of water 1000 kg/m^3) (a) Test the stability against overturning. (b) Determine compressive stresses and principal stresses at the toe and heel of the dam. (c) Calculate shear stress at the toe and heel of the dam. Consider only self weight of dam and water pressure.	**07**
		OR	
Q.3	**(a)**	Describe graphical method of stability analysis of dam.	**07**
	(b)	Explain Uplift forces, Drainage gallery and Construction joints.	**07**
Q.4	**(a)**	What precaution and remedial measures would you undertake to control the seepage through (i) Earthen dam body (ii) Through the dam foundations.	**07**
	(b)	In order to find the factor of safety of d/s slop during steady seepage, the section of the dam was drawn to scale of 1 cm = 4 m , and the following results obtained on a critical slip circle: Area of N rectangle = 14.4 sq. cm , Area of T rectangle = 6.4 sq. cm , Area of U rectangle = 4.9 sq. cm , Length of arc = 12.6 cm . Laboratory tests have furnished values of 26^0 for effective angle and 0.195 kg/cm^2 for cohesion. Unit weight of soil = 1.9 g/cm^3, Determine the factor of safety of the slop.	**07**
		OR	
Q.4	**(a)**	Write down computation of seepage rate using flow net.	**07**
	(b)	Explain the method of plotting phreatic line for an earth dam with horizontal filter at down stream.	**07**

Q.5	**(a)**	Describe various design principles of cross regulator and distributory head regulator.	**07**
	(b)	Write down comparison between USBR type stilling basin and IS type stilling basin.	**07**

OR

Q.5	**(a)**	Classify various types of Dam and write down merits and demerits of each.	**07**
	(b)	Write short note on Spillway Gates.	**07**

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