Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – VIII.EXAMINATION – WINTER 2016

Subject Code: 180601 **Date: 22/10/2016**

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.**

Q.1 **(a)** A homogenous earth dam has water depth of 25 m in the reservoir. The dam has free board of 3 m. The top width of earth dam is 6 m. The upstream slope of dam is 3 H to 1 V and downstream slope is 2 H to 1 V. The dam is constructed on an impervious strata. The coefficient of permeability of dam material (K) is 7 x 10^{-8} m/s. Plot the corrected seepage line on graph paper and estimate the seepage loss per unit length of the dam. **07**

(b) Explain with a neat sketch the Swedish slip circle method for stability analysis of earth dam. **07**

Q.2 **(a)** Explain for an earth dam the function of (i) cut-off trench (ii) horizontal filter and (iii) riprap with neat sketches. **07**

(b) Explain the classification of dams based on hydraulic design and structural design. **07**

OR

(b) Draw a neat sketch of rock-fill dam. How is the seepage of water controlled through the body of rock-fill dam? **07**

Q.3 **(a)** Calculate the normal stress at heel and toe of the gravity dam for reservoir full condition. For analysis consider only the self-weight, horizontal water pressure and uplift pressure (without drainage gallery). The details of dam are given below: **07**

1. Top width = 10 m
2. Free board = 4 m
3. Water depth in reservoir = 56 m
4. Upstream face of dam is vertical
5. Downstream slope 0.7 H to 1 V starts at 10 m from the top of dam.
6. Unit weight of concrete = 24 KN/m^3; unit weight of water = 9.81 KN/m^3
7. There is no tail water on downstream side.

(b) Discuss the effect of inertia force and hydrodynamic pressure on gravity dam. **07**

OR

Q.3 **(a)** Discuss the various modes of failure and stability criteria of gravity dams. **07**

(b) Explain the different types of galleries in the body of gravity dam. **07**

Q.4 **(a)** Explain the roller compacted concrete gravity dams. **07**

(b) Obtain the coordinates for downstream profile of an ogee spillway and the point of tangency. The design discharge is 7500 cumecs and height of spillway is 70 m. The spillway consists of 7 spans with clear width of 9 m each. The downstream slope is 0.72 H to 1 V. Take coefficient of discharge = 2.2, thickness of pier = 2.5 m, pier coefficient (K_p) = 0.01 and abutment coefficient K_a = 0.1. The upstream face of ogee spillway is vertical, take the constant value K = 2 and n = 1.85. **07**

OR

Q.4 **(a)** What do you understand by the elementary profile and a practical profile of gravity dam? How is the limiting height of a gravity dam calculated? **07**

(b) Explain the foundation treatment works for a gravity dam. **07**

Q.5 **(a)** Explain with a neat sketch the design steps of a straight glacis canal fall. **07**

(b) Explain with a neat sketch the functions of head regulator. **07**

OR

Q.5	**(a)**	Draw the L-section of a rectangular crest Sarda type canal fall. Explain the design features of a Sarda fall.	**07**
	(b)	Explain with a neat sketch the function of a cross regulator.	**07**

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