Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VII EXAMINATION – SUMMER 2016

Subject Code:X70601 **Date:10/05/2016**

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)**	Discuss the factor affecting the selection of the suitable site for a dam.	**07**
	(b)	What are the different modes of failure of an earth dam? Explain them in detail.	**07**
Q.2	**(a)**	Determine the ordinates of the seepage line through the dam section, as shown in Fig. 1, using Casagrande method. Assume that the outer shell is made of pervious material while the central core section is made of relatively impervious material having coefficient of permeability 2.1 X 10^{-5} m/sec. Draw the correct nature of the seepage line. Also, workout the seepage discharge per meter length of the dam when reservoir is full.	**07**
	(b)	Explain the Swedish slip circle method for the stability analysis of the upstream slope under sudden drawdown condition of an earth dam.	**07**
		OR	
	(b)	What is pore water pressure? Discuss the effects of pore water pressure on the stability of an earth dam.	**07**
Q.3	**(a)**	What may be the different foundation problems encountered in the dam construction? Suggest their remedial measures.	**07**
	(b)	What are the different forces likely to act on a gravity dam? Suggest the methods of reduction of uplift pressure on the dam.	**07**
		OR	
Q.3	**(a)**	Explain the functions of the following in the gravity dam: Galleries, Joints, Keys.	**06**
	(b)	Discuss the criteria for the safe design of a gravity dam.	**08**
Q.4	**(a)**	"Spillway is a safety valve in the dam"--Discuss. What are the different types of spillway and explain the working of Chute spillway, with a neat sketch.	**07**
	(b)	What are the functions of the energy dissipating structures in the dam? List the different types of energy dissipating structures constructed with the dam and explain any one of them with a suitable sketch.	**07**
		OR	
Q.4	**(a)**	Discuss various factors affecting the selection of a type of dam.	**06**
	(b)	Explain the following terms, in respect of Ogee spillway: Design head, Effective length of crest, Cavitation Compute the discharge over an Ogee weir at a head of 2.0 m. The length of the weir is 300 m and the weir crest is 7 m above the bottom of the approach channel having the same width as that of the weir. Take constant of discharge C = 2.3.	**08**
Q.5	**(a)**	Derive the expression for the limiting height of a low gravity dam. Also, differentiate between the high dam and low dam.	**06**

(b) The section of a concrete gravity dam is shown in Fig. 2. Calculate the normal stresses at the heel and toe of the dam for reservoir empty and full conditions. Consider the self-weight, water pressure and uplift pressure forces only. Also, calculate the factor of safety against overturning and shear friction factor. Take shear strength = 3.5 kPa, coefficient of friction μ = 0.75 and specific weight of concrete = 24 kN/m^3. **08**

OR

Q.5 **(a)** Discuss the design criteria for the Sarda fall. **07**

(b) With neat sketch, explain the location of cross regulator and distributary head regulator. What are their functions in the canal system? **07**

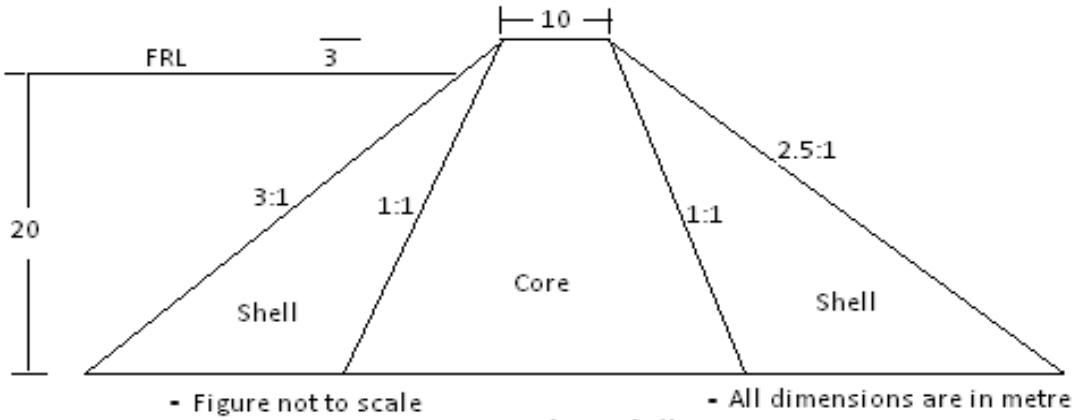

Fig. 1 (Q. 2 (a))

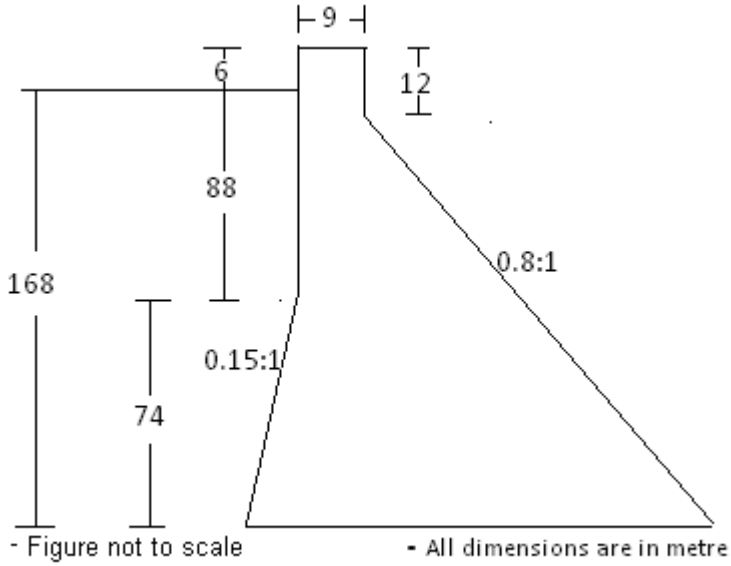

Fig. 2 (Q. 5 (b))

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