Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 711203N **Date: 12-01-2013**

Subject Name: Design of Hydraulic Structures

Time: 02.30 pm – 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)**	State the different uses of phreatic line and derive the equation $q = \frac{KhN_f}{N_d}$. With usual notations.	**07**
	(b)	Enlist the various forces acting on gravity dam as per IS-6512 and discuss in details earth quake and wave pressure.	**07**
Q.2	**(a)**	Discuss briefly various modes of failure of gravity dam.	**07**
	(b)	State the design consideration for earth dam in seismic zone.	**07**
		OR	
	(b)	Write the design procedure for Ogee Spillway.	**07**
Q.3	**(a)**	Calculate the stresses at the toe and heel for full reservoir condition for section of gravity dam as shown in Fig.-1. Neglect seismic forces; assume reasonable values for uplift and a line of drain holes 6.5 m downstream of the upstream face. Take unit weight of concrete as24 kN/m^3.	**07**
	(b)	State and discuss the different causes of failure of earth dam.	**07**
		OR	
Q.3	**(a)**	Construct a base parabola for earth dam as shown in Fig.-2. Determine the discharge through the body of earth dam per unit meter length when the permeability co-efficient for dam material is to be considered as 4.6×10^{-4}cm/sec. Take the value of $\frac{\Delta a}{a+\Delta a} = 0.36\, for\, \alpha = 30^0\, and\, 0.32\, for\, \alpha = 60^0$	**07**
	(b)	Explain the procedure for design of Chute spillway. Where would you prefer a Chute spillway or an ogee shaped spillway?	**07**
Q.4	**(a)**	Explain clearly the method of design of filter for earth dam.	**07**
	(b)	Distinguish clearly between a low gravity dam and high gravity dam. Derive an expression used for such a distinction.	**07**
		OR	
Q.4	**(a)**	State the different assumptions made in the stability analysis of earth dam.	**07**
	(b)	Discuss Swedish slip circle method for checking the stability of down stream slop under steady seepage condition.	**07**
Q.5	**(a)**	Enlist and discribe the various types of energy dissipation works.	**07**
	(b)	Write note on :(i) Foundation treatment for gravity dam. (ii) Zone method of designing gravity dam.	**07**

OR

Q.5 **(a)** Write the procedure for plotting of flow net for anisotropic soil of an earth dam. **07**

(b) Write notes on: **07**

(i) Pore water pressure and its significance in the design of earth dam.

(ii) Upstream impervious blanket and relief wells to reduce the seepage in earth dam

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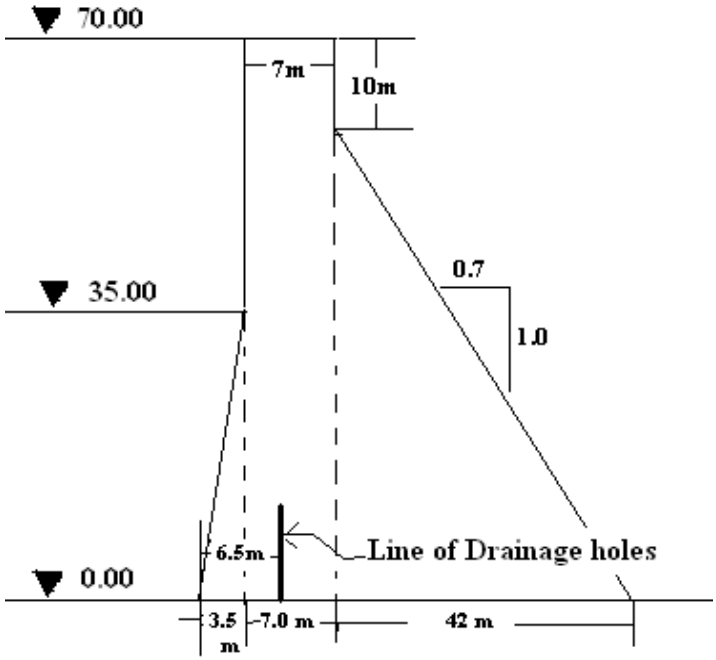
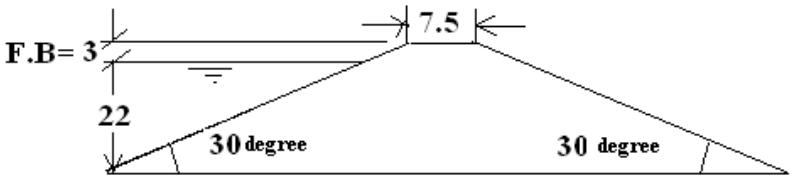


Fig.-1 Section of Gravity Dam Q-3(a)



Nf =3
Nd=15
K= 4.6x10E-4cm/s

Fig.2 Q.3(a) OR All Dimensions are in m