Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –Ist SEMESTER–EXAMINATION – JULY- 2012

Subject code: 711203 N **Date: 09/07/2012**

Subject Name: Design of Hydraulic Structures

Time: 2:30 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)** Discuss briefly various modes of failure of gravity dam. **07**

(b) State the different uses of phreatic line and derive the equation $q = \frac{KhN_f}{N_d}$.with usual notations. **07**

Q.2 **(a)** Enlist the various forces acting on gravity dam as per IS-6512 and discuss in details earth quake and wave pressure. **07**

(b) Write design procedure for Ogee Spillway. **07**

OR

(b) State the design consideration for earth dam in seismic zone. **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 as 24 kN/m^3. **07**

(b) Enlist and describe the different causes of failure of earth dam. **07**

OR

Q.3 **(a)** Construct the base parabola for the earth dam as shown in Fig.-2, also determine the discharge through the body of earth dam per unit meter length when permeability co-efficient for dam material is 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)** Discuss the various types of energy dissipation works. **07**

(b) Write note on :(i) Foundation treatment for gravity dam. **07**

(ii) Zone method of designing gravity dam.

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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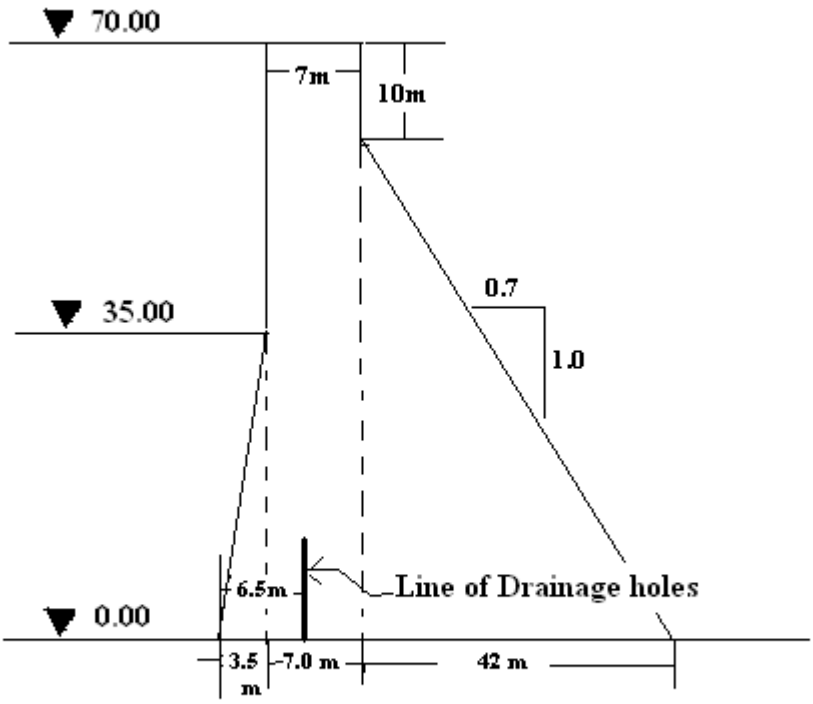
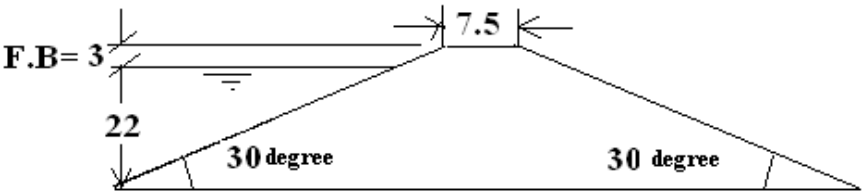


Fig.-1 Section of Gravity Dam Q-3(a)



Nf =3

Nd=15

K= 4.6x10E-4cm/s

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