

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 as 24 kN/m³. **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. **07**

Take the value of $\frac{\Delta a}{a + \Delta a} = 0.36$ for $\alpha = 30^\circ$ and 0.32 for $\alpha = 60^\circ$

(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 downstream slop under steady seepage condition. **07**

Q.5 (a) Enlist and describe 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
- Pore water pressure and its significance in the design of earth dam.
 - Upstream impervious blanket and relief wells to reduce the seepage in earth dam

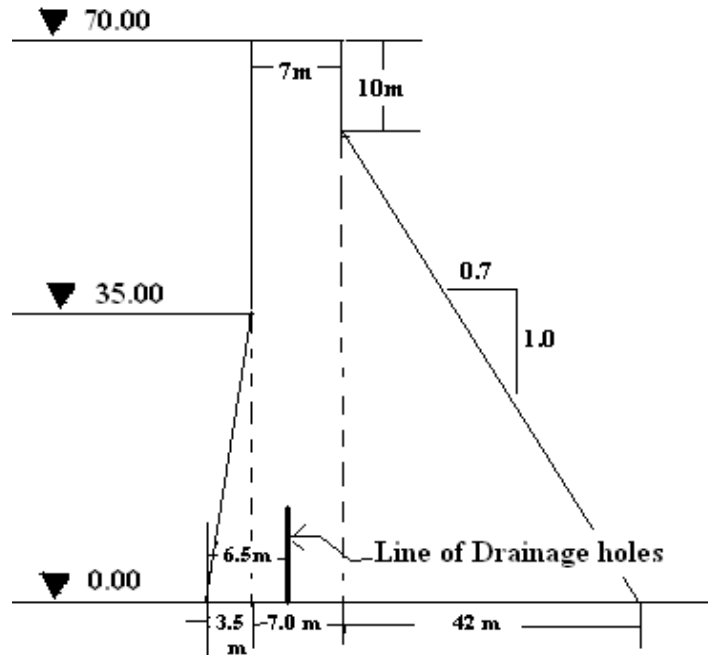


Fig.-1 Section of Gravity Dam Q-3(a)

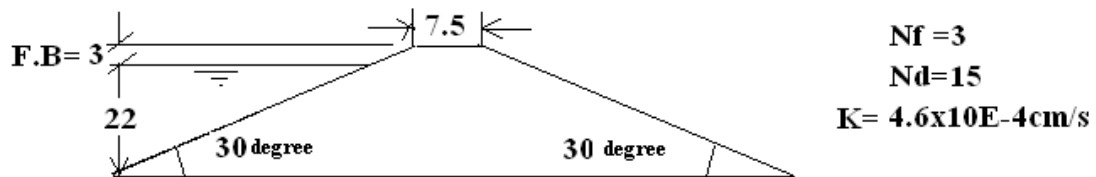


Fig.2 Q.3(a) OR All Dimensions are in m