Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. IST Semester–Remedial Examination – July- 2011

Subject code: 711203

Subject Name: Design of Hydraulic Structures

Date:11/07/2011 **Time: 10:30 am – 01:00 pm**

Total Marks: 60

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Explain the failure of gravity dam by crushing and derive the necessary stress equation with usual notions. Show the stress distribution for the three cases when (i) e<B/6 (ii) e=B/6 and (iii)e>B/6 where e is the eccentricity from the centre of the column, B is the width of the column ΣV is the summation of all the vertical forces **06**

(b) Draw the typical cross section of earth dam when (i) only pervious material is available and (ii) both pervious and impervious materials are available. **06**

Q.2 **(a)** State the design consideration for earth dams in seismic regions. **06**

(b) What is an elementary profile of a gravity dam? Suggest the necessary modifications of elementary profile. **06**

OR

(b) Explain the pore water pressure and its significance in design of earth dam. **06**

Q.3 **(a)** Discuss in detail the principal and shear stresses in gravity dam. **06**

(b) For a gravity dam for the following data, find the factor of safety against over turning and principal stress at the toe. **06**

(i) Top width of the dam=6.0m
(ii) Top RL=130.0
(iii) Full supply level =127.0
(iv) U/s face vertical from top surface to foundation and D/s face vertical from RL 130.0 to RL= 120.0 and sloping from RL=120.0 to foundation at 0.75H: 1V
(v) Foundation RL=100.0
(vi) Unit weight of concrete = 24KN/m^3
(vii) Unit weight of Water =10KN/m^3

OR

Q.3 **(a)** What are the essential requirements of a spillway? How would you select a suitable site for the spillway? **06**

(b) State and explain the factors affecting the required spillway capacity. **06**

Q.4 **(a)** What are the basic requirements of the filter in an earth dam? Discuss briefly the rules for the design of filters. **06**

(b) Discuss the design criteria for slotted roller bucket. **06**

OR

Q.4 **(a)** State clearly the characteristics of phreatic line with its uses. **06**

(b) Obtain the co ordinates of a phreatic line for an earth dam shown in fig.1. Also **06**

find the quantity of seepage discharge through the body of the dam per unit length the permeability co efficient $K=4.2x10^{-4}$ cm/s, no. of flow channels (N_f)= 3 and N_d=18

Q.5 **(a)** Explain briefly the stability of u/s slope during sudden drawdown condition and shown the distribution of pore water pressure. **06**

(b) Check the stability of u/s slope of the earth dam shown in fig.2. Assume the following properties of the soil:- **06**

(i) Saturated unit weight=21KN/m^3
(ii) Average unit weight under steady seepage =20KN/m^3
(iii) Angle of repose of soil= 26°
(iv) c=20 KN/m^2

For a trial slip surface the corresponding N and T-diagrams were plotted to a scale 1cm= 5m and respective area of N diagram, a_n =15.5cm^2, a_t = 4.25cm^2, radius of slip circle= 78.5m and central angle was found 56°.whether this section is safe or not?

OR

Q.5 Write short notes : **12**

(i) Location of the most critical circle
(ii) Surface protection of u/s face of earth dam
(iii) Criteria for safe design of earth dam
(iv) Stability of d/s slope during steady seepage condition.

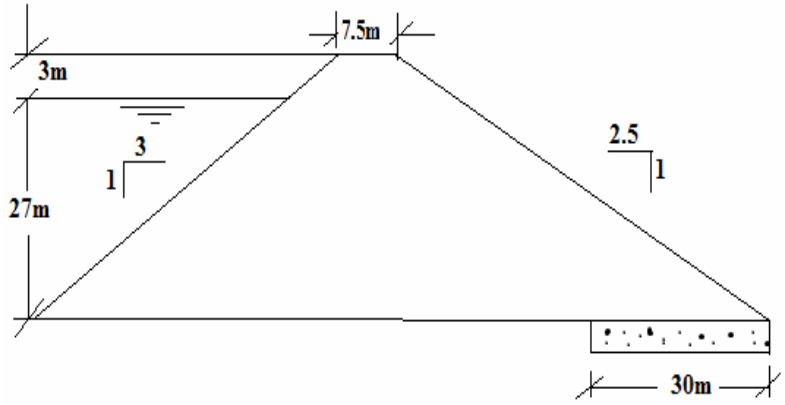

Fig.1 Q.4(b) OR

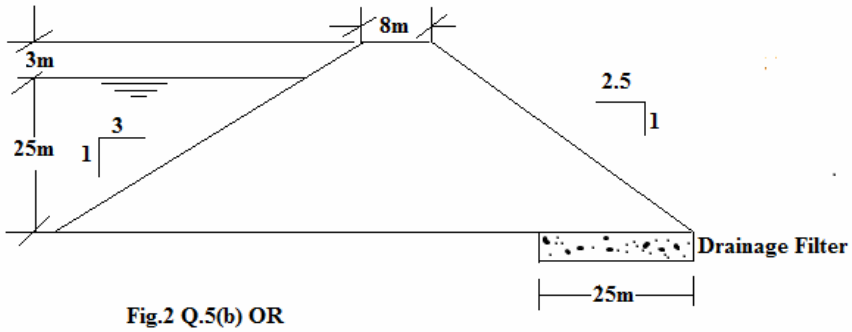

Fig.2 Q.5(b) OR

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