Printed Pages : 4

ECE-052

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 100852

Roll No.

B. Tech.

(SEM. VIII) THEORY EXAMINATION, 2014-15

ANALYSIS AND DESIGN OF HYDRAULIC STRUCTURES

Time : 3 Hours] [Total Marks : 100

Note:-Attempt all questions.

Use of Khosla's chart is permitted.

Assume any missing data, if any.

1 Attempt any two questions. 10×2=20

(a) Explain with neat sketch the various types of cross drainage works. Also write the necessity of cross drainage works.

(b) Determine the percentage pressures at various key points in fig. 1. Also determine the exit gradient and plot the hydraulic gradient line for the pond level on u/s and no flow on d/s.

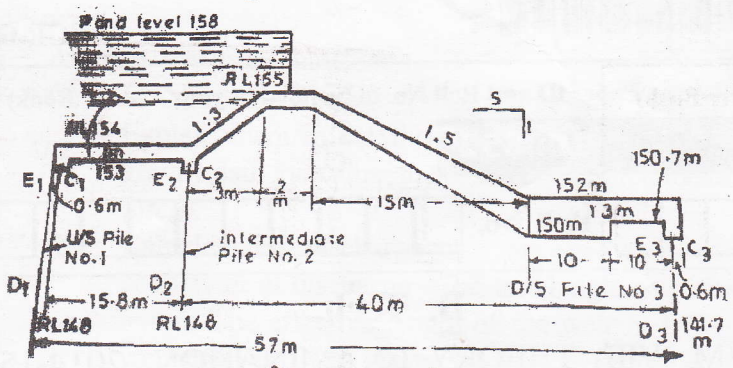

Figure - 1

(c) Enumerate and explain by neat sketches the different ways by which the earthen dam may fail. Also suggests suitable precautions that should be undertaken to avoid each type of failure.

2 Attempt any four questions. 5×4=20

(a) Derive an expression for the limiting height of a low gravity dam.

(b) Explain the term Level Crossing, Inlets and Outlets.

(c) What is meant by an `energy dissipator'? Discuss the various methods used for energy dissipation below spillways.

(d) A flownet is plotted for a homogenous earthen dam of height 22m and freeboard 2m. The results obtained are:
Number of potential drops = 10
Number of flow channels = 4
The dam has a horizontal filter of 30m length at the downstream end and the coefficient of permeability of dam material is 5×10^{-4}cm/sec. Calculate the discharge per m run of the dam.

(e) What are the modes of failure of a hydraulic structure on permeable foundation? Explain them with their remedies.

(f) What do you understand by canal head regulator? What are its main functions?

3 Attempt any two questions. 10×2=20

(a) (i) Give the classification of Hydro-power plants on the basis of operating head on turbines.

(ii) Define and differentiate between load factor, utilisation factor and plant factor in connection with hydropower.

(b) An overfall spillway passes a discharge of $7.83 m^3/s/m$ width with a fall of 12.5m. Depth of water available on the downstream is 2m. Depth of flow at the foot of spillway is 0.5m. Calculate the leading dimensions of hydraulic jump stilling basin.

(c) Explain life of a reservoir. Write the procedure for the calculation of life of reservoir. Also explain any four methods of reservoir sediment control.

4 Attempt any four questions, 5×4=20

(a) Explain the U.S.B.R. recommendations for determining the uplift pressure under the base of a dam provided with a drainage gallery.

(b) Explain with neat sketch the difference between weir and barrage.

(c) What do you understand by canal escapes? Explain the various types of canal escapes with neat sketch.

(d) What are the various types of galleries in gravity dam? Also write their functions.

(e) Enumerate the important types of spillway gates. Describe with neat sketch the construction of 'Tainter gate'.

(f) What is a canal fall? What are the various types of canal falls?

5 Attempt any two questions. 10×2=20

(a) What are the various forces acting on a gravity dam? Explain them in detail. Also draw a neat sketch of a gravity dam indicating the position and direction of these forces.

(b) Calculate the discharge over an ogee weir with the coefficient of discharge = 2.5 and height over the weir = 4m. The effective length of the weir is 100m. The weir crest is 10 m above the bottom of the approach channel. Consider the following cases:

a. Neglecting velocity of approach

b. Considering velocity of approach.

(c) Fig. 2 shows the section of a gravity dam (non-overflow portion) built of concrete. Calculate (neglecting earth-quake effects)

i. The maximum vertical stresses at the heel and toe.

ii. The major principal stress at the toe of the dam.

iii. The intensity of shear stress on a horizontal plane near the toe.

Assume wt. of concrete =23.5 kN/m^3;
Allowable stress in concrete may be taken 2500 kN/m^2.

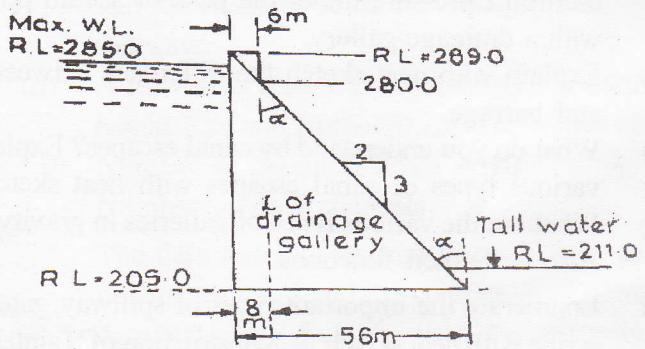

Fig. 2