

CBCS SCHEME

USN

1A418CV073

18CV744

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022

Design of Hydraulic Structures

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. Use of Khosla's charts are permitted.

Module-1

- 1 a. With the help of a neat diagram explain the forces acting on a gravity dam. (10 Marks)
- b. A masonry dam 6m high is 1.5m wide at top and 4.5m wide at bottom, with vertical water face. Determine the normal stress at the heel and toe for reservoir empty conditions. Take $\rho = 2.4$ (06 Marks)
- c. What is drainage gallery? List the functions of drainage gallery. (04 Marks)

OR

- 2 a. With a neat sketch explain the modes of failure of a gravity dam. (10 Marks)
- b. Design practical profile of a gravity dam of stone masonry, given the following data.
RL of base of dam = 1350 m
RL of FRL = 1380.5 m
Specific gravity of masonry = 2.4
Safe compressive stress for masonry = 1200 kN/m^2
Height of wave = 1 m. (06 Marks)
- c. Differentiate between low gravity dam and high gravity dam. (04 Marks)

Module-2

- 3 a. Briefly explain the different types of earthen dam and draw neat sketches showing each type. (08 Marks)
- b. A flownet is plotted for a homogeneous 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 at the downstream end and the coefficient of permeability of the dam material is $5 \times 10^{-4} \text{ cm/s}$. Calculate the discharge per m run of the dam. (04 Marks)
- c. How seepage discharge is computed in
(i) Isotropic soils (ii) Non Isotropic soils. (08 Marks)

OR

- 4 a. With neat sketch explain the structural failure in earthen dam. (10 Marks)
- b. Fig.Q4(b) shows a homogeneous earth dam. Calculate the seepage per meter length, through the body of the dam. Coefficient of permeability of the dam material can be taken as $8 \times 10^{-3} \text{ cm/s}$. (10 Marks)

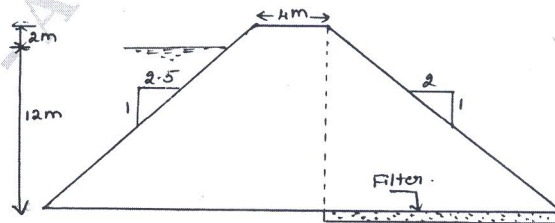


Fig.Q4(b)

Module-3

- 5 a. What is spillway? Mention different types of spillway. Briefly describe an ogee spillway with neat sketch. (08 Marks)
- b. What is Bligh's theory? Using Khosla's theory, determine the pressure at C_1 with interference correction. [Refer Fig.Q5(b)]

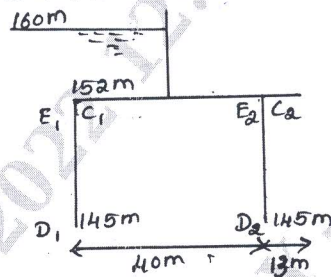


Fig.Q5(b)

(08 Marks)

- c. Discuss the various factors affecting the coefficient of discharge in the discharge equation. Also compute the discharge over an ogee spillway with coefficient of discharge $C = 2.3$ at the head of 3.8m. The effective length of the spillway is 110m. Neglecting the velocity of approach. (04 Marks)

OR

- 6 a. What is meant by energy dissipater? Discuss the various methods used for energy dissipation below spillway. (08 Marks)
- b. Design a suitable section for the overflow section of a concrete gravity dam having the downstream face sloping at a slope of 0.7H : 1V. The design discharge for the spillway is 6000 cumecs. The height of the spillway above the river bed is 60m. The effective length of the spillway may be taken as 50m. (12 Marks)

Module-4

- 7 a. What is meant by cross drainage work? Describe with the help of neat sketches various types of cross drainage work. (12 Marks)
- b. What are the factors to be considered for selection of suitable cross drainage work? Explain. (08 Marks)

OR

- 8 What are the design steps adopted when the water depth in the transition varies using Hind's method? Also explain design of transition at U/S and d/s. (20 Marks)

Module-5

- 9 a. What are canal outlets? Explain any two canal outlets with neat figure. (10 Marks)
- b. What is the necessity of canal falls? Explain any two types of canal falls with neat sketch. (10 Marks)

OR

- 10 a. What are the functions of head regulator and canal regulator? (10 Marks)
- b. Explain with sketches : (10 Marks)
- Trapezoidal notch fall
 - Vertical drop fall.
