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Seventh Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025 Design of Hydraulic Structures

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. With neat sketch, explain the different forces acting on the gravity dam. (10 Marks)
- b. A triangular section of a gravity dam having base width 30 m and height 40 m is stored with water upto top. Analyse the dam section and determine.
 - i) Factor of safety against sliding
 - ii) Factor of safety against overturning
 - iii) The normal stresses in the base of the dam

Assume coefficient of friction between the base and foundation is 0.7 and unit weight of dam material is 24 kN/m^3 . (10 Marks)

OR

- 2 a. Explain step by step the analytical procedure to be adopted for analyzing the stability of gravity dam. (08 Marks)
- b. Explain various types of failure modes in gravity dam. (06 Marks)
- c. Write a note on drainage galleries. (06 Marks)

Module-2

- 3 a. With neat sketch explain causes of failure of earthen dam. (10 Marks)
- b. Explain how to determine phreatic line with filter using Casagrande's method. (10 Marks)

OR

- 4 a. Explain with neat sketch types of earthen dams. (08 Marks)
- b. Write neat sketch of the preliminary section of earth dam and explain its components. (06 Marks)
- c. How to control seepage in earth dams? (06 Marks)

Module-3

- 5 a. How do you design the apron using Bligh's theory? Explain. (10 Marks)
- b. What is spillway? With neat sketch explain the types of spillways. (10 Marks)

OR

- 6 a. What is energy dissipator? Discuss the various methods used for energy dissipation below spillway. (08 Marks)
- b. A saddle siphon spillway has the following data :

Full reservoir level = 485.0 m
 Level of centre of siphon outlet = 479.6 m
 High flood level = 485.9 m
 High flood discharge = 570 cumec

If the dimensions of the throat of the siphon are, width = 4.2 m and height = 1.9 m, determine the number of siphon units required to pass the flood safely. The siphon is to discharge freely in the air. Assume coefficient of discharge = 0.65. (06 Marks)

- c. With neat sketch, explain the concept of flow net. (06 Marks)

Module-4

- 7 Design a suitable cross – drainage work, given the following data at the crossing of a canal and drainage.

Canal :

Full supply discharge = 32 cumec

Full supply level = 213.5 m

Canal bed level = 212.0 m

Canal bed width = 20 m

Trapezoidal canal section with 1.5 H : 1 V slopes.

Canal water depth = 1.5 m

Drainage :

High flood discharge = 300 cumec

High flood level = 210.0m

High flood depth = 2.5m

General ground level = 212.5 m

(20 Marks)

OR

- 8 a. What is cross drainage work? Explain with neat sketch different types of cross drainage work. (08 Marks)
- b. Explain the necessity of cross drainage work. (06 Marks)
- c. What are the factors to be considered for selection of suitable cross drainage work? (06 Marks)

Module-5

- 9 a. What is canal drop? With neat sketch explain the types of canal drops. (10 Marks)
- b. What are canal regulation works? With neat sketch explain the structures of canal regulation works and mention its necessity. (10 Marks)

OR

- 10 a. What are canal outlets? Explain the types of canal outlets. (10 Marks)
- b. What are the functions of head regulator and cross regulator? (10 Marks)

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