Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S,FE) (FT/WP/PT) Examination December 2025 (2019 Scheme)

Course Code: CET306

Course Name: DESIGN OF HYDRAULIC STRUCTURES

Max. Marks: 100 Duration: 3 Hours

- **Use of Khosla's Chart, Blench Curves and Montague Curves are permitted in the Examination Hall**
- **Assume suitable design data whichever necessary**

PART A

Answer one full question from each module, each carries 15 marks. Marks

Module I

1 a) Explain the functions of a diversion headwork with a neat sketch. (9)

b) Explain the major causes of subsurface failure of hydraulic structures and state its remedial measures. (6)

OR

2 a) An impervious floor of a weir on permeable soil is 24 m long and has sheet piles at both ends. The upstream pile is 4 m deep and the downstream pile is 5 m deep. The weir creates a net head of 4 m. Calculate uplift pressures at points 8 m and 16 m from the upstream end and the corresponding thicknesses of the floor using Bligh's theory. The specific gravity of floor material is 2.24. (9)

b) Explain the corrections that need to be incorporated in the design of impervious floors of hydraulic structures using Khosla's theory. (6)

Module II

3 a) Explain the different types of cross-drainage works with neat sketches. (12)

b) Sketch the cross-section of a canal and mark its components. (3)

OR

4 a) Design a regime channel using Lacey's theory, for a discharge of 25 cumecs, side slopes = ½H: 1V and silt factor = 1 (10)

b) Discuss the drawbacks of Kennedy's theory. (5)

PART B

Answer any one full question

Module III

5 a) Design a suitable cross drainage work, for the following data at the crossing of canal and drainage. (25)

Canal

Full supply discharge = 40 cumecs

Full supply level = 185.5m

Canal bed level =184m

Canal bed width = 20 m

Trapezoidal canal section with 1.5H:1V slopes

Canal water depth = 1.5 m

Drainage

High flood discharge = 400 cumecs

High flood level =182m

High flood depth = 2 m

General ground level = 184.5

b) Prepare the following drawings (not to scale) (25)

i. Half sectional plan at top and foundation level.

ii. Section along the center line of the canal.

OR

6 a) Design a notch fall for the following data (25)

Bed level of the canal above the drop = 100 m

Full supply discharge = 4 cumecs

No of notches = 2

Full supply depth =1.2 m

Half supply depth =0.9 m

Bed width = 6.5 m

At the proposed site a fall of 1.6m is available. A good foundation is available 1m below the natural surface level. The canal section and flow conditions are the same below

the fall. Assume any other data if required.

b) Prepare the following drawings (not to scale) (25)

iii. Half sectional plan at top and foundation level.

ii. Section along the center line of the channel.

PART C

Answer one full question from each module, each question carries 10 marks

Module IV

7 Check the stability of the gravity dam for the following data. Top width = 8m, Freeboard = 2m, u/s FRL depth = 43m, d/s remains vertical up to 10m from the top, and then batters with a slope = 0.9H to 1V, u/s remains vertical. Assume g as 9.81m/s^2 and the density of the gravity dam as 24.5kN/m^3. There is no tail water and silt. (10)

OR

8 a) Explain various forces acting on the gravity dam. (6)

b) Discuss the relevance of the limiting height of the gravity dams. (4)

Module V

9 a) Which is the most common type of spillway used in our country? Explain. (5)

b) Explain the design criteria of an earthen dam. (5)

OR

10 a) Derive an expression for the thickness of an arch dam using the thin cylinder theory. (5)

b) Explain the arrangements provided below the spillway for energy dissipation. (5)

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