Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (R,S) / S6 (PT) / (WP) Exam April 2025 (2019 Scheme)

Course Code: CET306

Course Name: DESIGN OF HYDRAULIC STRUCTURES

Max. Marks: 100 Duration: 3 Hours

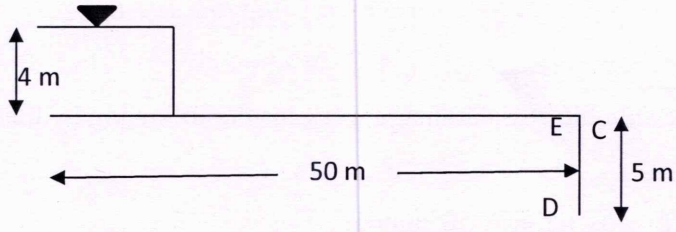
- **Use of Khosla's Chart, Blench Curves and Montague Curves are permitted in the Examination Hall**
- **Assume suitable design data wherever necessary**

PART A

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

Module I

1 a) Determine the uplift pressure at the salient points E, D, and C of the pile shown in Figure below: (8)



Also, what will be the uplift pressure at the salient points E_1, D_1, C_1 if this pile of 5 m depth is at the upstream end of the impervious floor.

b) Explain the functions of, (7)

(a) Under sluice

(b) Silt Excluder & Silt Ejector

(c) Fish Ladder.

OR

2 a) Two end sheet piles of length 6m (upstream end) and 8m (downstream end) are provided below an impervious floor of 25m length. Total head created on the floor is 5 m. Calculate the average hydraulic gradient. Also find the uplift pressures at points 6, 10 and 18m from the u/s end of the floor and find the thickness of the floor at these points using Bligh's creep theory. Take specific gravity of concrete as 2.25. (8)

b) Explain piping failure in hydraulic structures with the help of a neat figure and suggest remedial measures. (7)

Module II

3 a) Design an irrigation channel from the following data. Also determine the longitudinal slope in the channel. Apply Lacey's theory. Full supply discharge = 50 cumecs, Channel side slopes = ½ horizontal : 1 vertical, Mean particle size of soil = 0.323 mm (9)

b) What are the different types of cross drainage works at canal crossings, and when would each type be used? (6)

OR

4 a) Find the efficient cross-section of a canal having the discharge 10 cumecs. Assume, bed slope 1 in 5000, value of N =0.0225, Critical Velocity Ratio (CVR)= 1, full supply depth not to exceed 1.6 m and side slope 1:1. Use Kennedy's theory. (9)

b) Explain the differences between Lacey's and Kennedy's theory for design of unlined canals in alluvial soil. (6)

PART B

Answer any one full question

Module III

5 a) Design a suitable cross drainage work for the following hydraulic particulars: (25)

Canal:

Full supply discharge = 50 cumecs

Full supply level = 182.50 m

Canal bed level = 181.00 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 = 350 cumecs

High flood level = 170.00 m

High flood depth = 2.5 m

General ground level = 181.50 m

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

(i) Half plan at top and half at foundation level. (15)

(ii) Section through the centre line of the drain. (10)

OR

6 a) Design a Sarda type fall for a channel from the following data: (25)

Upstream:

Full supply discharge = 50 cumecs

Full supply level = 103.50m

Full supply depth = 2.00 m

Bed width = 35 m

Downstream:

Full supply discharge = 50 cumec

Full supply level = 102.00 m

Full supply depth = 2.00 m

Bed width = 35m

Drop = 1.50 m, Side slope = 1:1, Safe exit gradient = 1/5. Use Khosla's theory.

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

(i)Half plan at top and half at foundation level. (15)

(ii)Section through the centre line of the channel. (10)

PART C

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

Module IV

7 a) What are the various failure modes in gravity dams? (4)

b) Explain the elementary and practical profiles of a gravity dam with sketch. (6)

OR

8 a) What is the impact of uplift pressure on a gravity dam, and how does the inclusion of galleries affect this uplift pressure? (4)

b) Derive the equations for principal stress and shear stress at the toe of a gravity dam. (6)

Module V

9 a) What is meant by the most economical central angle of an arch dam? Derive the most economical central angle of an arch dam. (6)

b) Explain the different components of stilling basin and how they help in energy dissipation below a spillway. (4)

OR

10 a) What is a spillway? Explain the profile of Ogee spillway when it is used in a gravity dam with neat sketch. (6)

b) What are the different types of earthen dams? (4)

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