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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth semester B.Tech examinations (S), September 2020

Course Code: CE302

Course Name: DESIGN OF HYDRAULIC STRUCTURES

Max. Marks: 100 Duration: 4 Hours

Use of Khosla's charts are permitted in the exam hall

Assume suitable data wherever necessary

PART A

Answer any two full questions, each carries 15 marks.

Marks

1 a) Explain the Khosla's theory of independent variables. (6)

b) Explain the components of unlined canal sections with sketches. (5)

c) Explain the causes of failure of weirs on permeable soils. (4)

2 a) A hydraulic structure built on fine sand has the following details: (6)

Total length of the floor = 29 m, a weir at 6 m from u/s end, effective head of water 4 m, sheet pile at u/s end 5 m deep, sheet pile at d/s end 6 m deep, intermediate piles of 3 m depth at 12 m from u/s end. Determine: a) Average hydraulic gradient, b) Uplift pressures at points A = 6 m, and B = 20 m from upstream end and corresponding thicknesses of floor using Bligh's theory. Specific gravity of floor material is 2.24.

b) Compare Kennedy's theory and Lacey's theory for design of canals through alluvial soils. (4)

c) Explain the different types of canal falls (5)

3 a) Using Lacey's theory, design a regime channel for a discharge of 43 cumecs, side slopes ½: 1 and silt factor 1.1. (6)

b) Explain the different types of aqueducts. (4)

c) What are the general considerations for canal alignment? (5)

PART B

Answer any one full question, each carries 50 marks.

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

Canal:

Full supply discharge = 42 cumecs

Full supply level = 192.7 m

Canal bed level = 191.0 m

Canal bed width =26 m

Trapezoidal canal section with 1.5 H: 1 V slopes

Canal water depth = 1.7 m.

Drainage:

High flood discharge = 340 cumecs.

High flood level = 189.0 m

High flood depth = 2.7 m.

General ground level = 191.5 m.

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

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

ii) Section through the centre line of the drain.

5 a) Design a Sarda Type fall with drop of 1.4 m for a canal carrying a discharge of 35 cumecs with the following data: (25)

Bed level upstream = 104 m

Bed level downstream = 102.6 m

Side slopes of channel = 1:1

Full supply level upstream = 105.6 m

Bed width u/s and d/s = 27 m

Safe exit gradient = 1/5

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

i) Half plan at top and half at the foundation level.

ii) Section through the centre line of the canal.

PART C

Answer any two full questions, each carries 10 marks.

6 a) Explain chute spillway and side channel spillway. (4)

b) List the forces acting in a gravity dam. (2)

c) What is a stilling basin? Explain Type I and Type II stilling basins. (4)

7 a) What are the functions of gallery in a gravity dam? (2)

b) With the help of a neat sketch, derive the expression for thickness of arch ring at (4)

a depth 'h' m below the water surface in the reservoir.

c) What is meant by elementary profile of a gravity dam? (4)

8 Check the stability of the gravity dam with the following data: (10)

Reduced level of the dam at the base = 90 m

Height of dam = 250 m

Maximum water surface elevation = 336 m

Top width = 8 m

Upstream face is vertical and downstream face is vertical up to elevation 330 m and has a slope of 0.8 horizontal to 1 vertical below this elevation. Assume no tail water and no drainage galleries. Density of concrete is 24 kN/m^3 and coefficient of friction is 0.75.

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