Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: CE 302

Course Name: DESIGN OF HYDRAULIC STRUCTURES

Max. Marks: 100 Duration: 4 Hours

Use of Khosla's chart, Blench curve and Montague curve are permitted in the exam hall

PART A

Answer any two full questions, each carries 15 marks.

Marks

1 a) Distinguish between Bligh's theory and Khosla's theory. (4)

b) Explain the different types of aqueducts. (5)

c) A channel section has to be designed for the following data. Discharge = 300 cumecs, silt factor =1, side slope 0.5:1. Also find the longitudinal slope. (6)

2 a) What are the different types of cisterns used in falls? (4)

b) Distinguish between watershed canal and contour canal (4)

c) Calculate the length of waterway, regime sour depth and the total energy level at the upstream of a vertical drop weir for the following data. Maximum flood discharge = 2600 cumecs, H.FL before construction = 290.0m, minimum water level =d/s bed level = 283.0m, F.S.L of canal =289.0m, allowable flux = 1.0m and f=1. (7)

3 a) What is balancing depth? (2)

b) Two end sheet piles of length 6m and 8m are provided below an impervious floor of 25m length. Total head created on the floor is 5m. Calculate the average hydraulic gradient. Also find the uplift pressures at points 6, 12 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. (9)

c) Explain the terms piping and uplift. How can this be controlled? (4)

PART B

Answer any one full question, each carries 50 marks.

4 a) Design a notch fall for the following data: (25)

Full supply discharge = 2 cumecs

Full supply depth =0.8m

Half supply depth = 0.51m

Bed width = 5.5m

Top width of banks = 1.5m

At the proposed site a fall of 1.5m is available. Good foundation is available 1m below natural surface level. The canal section and flow conditions are same below the fall. Assume any other data if required.

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

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

ii. Section across the channel through the notch fall.

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

Canal

Full supply discharge = 25 cumecs

Bed level = 112.00

Full supply level = 113.50

Bed width = 18.0m

Side slope =1.5 H :1 V

Left bank is 3.0m wide. Right bank is 4.5m wide and the cross drainage work carries a roadway of 4.5m over it.

Drainage

Catchment area = 175 sq.km

Ryve's coefficient =10

Bed level = 106.80

High flood depth = 3.2m

General ground level = 113.20

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

i. Half sectional plan at the foundation level.

ii. Section along the centre line of the canal.

PART C

Answer any two full questions, each carries 10 marks.

6 a) What are the design criteria for an earth dam? (5)

b) Distinguish between a gallery and a shaft in a dam. (2)

c) Explain the components provided in a stilling basin for energy dissipation. (3)

7 a) Derive an expression for the thickness of an arch dam using thin cylinder theory (4)

b) Distinguish between a main spillway and an emergency spillway (4)

c) Find the limiting height of a low concrete gravity dam, constructed in concrete having strength equal to 3000KN/m^2 (2)

8 a) How will you estimate the uplift pressure under gravity dams? How the uplift pressure diagram will get modified under (5)

i. The presence of a drainage gallery

ii. Tension crack near the heel of the dam?

b) Explain the term effective length of spillway. Give an expression for ogee spillway. (3)

c) Why are keys provided in a dam? (2)

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