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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 2021

HYDRAULICS

[Maximum Marks: **100**] [Time: **3** Hours]

(PART-A)

[Maximum Marks: 10]

I. (Answer ***all*** the questions in one or two sentences. Each question carries **2** marks)

1. Define Total pressure and Centre of pressure.
2. Define Vena contracta.
3. Define Mouthpiece.
4. Define Notch.
5. Define Critical velocity.

(5 x 2 = 10)

(PART-B)

[Maximum Marks: 30]

II. (Answer any ***five*** of the following questions. Each question carries **6** marks)

1. A rectangular tank 14.2 m long and 1.5 m wide contains water to a depth of 2 meters. Find the intensity of pressure on the base of the tank and the total pressure on the end.
2. An equilateral triangle plate of 1.5 m side is vertically immersed in water such that, its centre of gravity is at a depth of 5m below the surface of water. Find the Total pressure acting on the plate.
3. A circular tank of diameter 1.25 m contains water up to a height of 5 m. An orifice of 50 mm diameter is provided at its bottom. If Cd = 0.62, Find the height of water above the orifice after 1.5 minutes.
4. A rectangular notch has a discharge of 21.5 m^3 per minute when the head of water is half the length of the notch. Find the length of the notch. Assume Cd = 0.6
5. Explain the advantage of Triangular notch over rectangular notch.

6. Find the diameter of the pipe of length 2000 m when the rate of flow of water through the pipe is 200 l/sec and the head lost due to friction is 4m. Take the value of C = 50 in Chezy's formula.
7. A rectangular channel carries water at the rate of 400 l/sec when bed slope is 1 in 2000.Find the most economical dimension of the channel if C = 50. (5x 6=30)

(PART-C)

[Maximum Marks: 60]

(Answer ***one*** full question from each Unit. Each full question carries **15** marks)

UNIT-I

(Answer *one* full question from each unit. Each question carries 15 marks)

III (a) A pipe 5 m long is inclined at an angle of 30^0 with the horizontal. The smaller section of the pipe which is at a lower level is 8 cm in dia and the larger section of the pipe is 24 cm dia. Determine the difference of pressure between the two sections if the pipe is uniformly tapering and the velocity at the smaller end is 1 m per second. (8)

(b) The right limb of a simple U-tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of sp. gravity 0.9 is flowing. The centre of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limb is 20 cm. (7)

OR

IV (a) A rectangular plane surface 3 m wide and 4 m deep lies in water in such a way that its plane makes an angle of 30^0 with the free surface of water. Determine the Total pressure force, and position of centre of pressure, when the upper edge is 2 m below the free surface. (8)

(b) A Venturimeter is to be fitted in a pipe 0.25 m dia, where the pressure head is 7.6 m of flowing liquid and the maximum flow is 8.1 m^3 per minute. Find the least dia of the throat to ensure that the pressure head does not became negative, take k = 0.96. (7)

UNIT – II

V. (a) Water discharge at the rate of 98.2 l/sec through a 120 mm diameter vertical sharp edged orifice placed under a constant head of 10 meters. A point on the jet, measured from the vena contracta of the jet has co-ordinates 4.5 meters horizontal and 0.54 meters vertical. Find the co-efficient CV, CC and Cd of the orifice. (8)

(b) A rectangular orifice of 2m width and 1.2 m deep is fitted in one side of a large tank. The water level on one side of the orifice is 3m above the top edge of the orifice, while on the other side of the orifice, the water level is 0.5m below its top edge. Calculate the discharge through the orifice if Cd=0.64. (7)

OR

VI. (a) Explain the main parts of a Centrifugal pump. (8)

(b) Sketch a Pelton wheel and name the parts. (7)

UNIT – III

VII. (a) Water flows over a rectangular weir 1m wide at a depth of 200 mm and afterwards passes through a triangular right angled weir. Taking Cd for rectangular and triangular weir as 0.62 and 0.60 respectively. Find the depth over the triangular weir. (8)

(b) A broad crested weir of 50m long has 70cm height of water above the crest. Calculate the maximum discharge over the weir. Velocity of approach is 1.5m/sec. AssumeCd=0.62. Neglect end contraction if any. (7)

OR

VIII. (a) Explain the functions of Surge tank, Pen stock, Anchor block and Tail race. (8)

(b) Sketch the layout of a hydroelectric power plant and name the parts. (7)

UNIT – IV

IX (a) Design the most economical section of trapezoidal channel to convey a discharge 10,200 cubic meters per hour. Adopt bed slope as 1 in 1200 and side slopes 1 vertical to 2 horizontal. Take C = 30. (8)

(b) Compute the discharge flowing through pipe line of diameter 300 mm. If the loss of head due to friction in a length of 600 meters is 50.4 m. Take f = 0.01. Neglect minor losses. (7)

OR

X (a) A rectangular channel is 9 m wide and 3 m deep. Find the bed slope to be maintained to carry a discharge of 65 m^3/sec. Take Chezy's constant as 60. (8)

b) An earthen channel with base 3 m wide and side slopes 2 vertical 1 horizontal carries water with a depth of 1.05 m. The bed slope is 1 in 625. Calculate the discharge. Take N = 0.03 in Mannings formula. (7)

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