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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, APRIL - 2025

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: (i) Steady flow (ii) Uniform flow.
2. State any two devices used for measuring fluid pressure.
3. Name any two reaction turbines.
4. Differentiate between notches and weirs.
5. Define wetted perimeter. (5 x 2 = 10)

PART – B
Maximum marks: 30

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

1. Explain the total energy of a liquid particle in motion.
2. Define: (i) Atmospheric Pressure (ii) Gauge pressure (iii) Vacuum pressure
3. A jet of water issuing from a sharp-edged vertical orifice under a constant head of 10cm, at a certain point has the horizontal and vertical coordinates measured from the vena-contracta as 20 cm and 10.5 cm respectively. Find the value of C_v and C_c if $C_d = 0.6$. Calculate the discharge of water flowing over a rectangular notch of 2 m length when the constant head over the notch is 300 mm. Take $C_d = 0.60$.
4. Explain the various hydraulic coefficients.
5. The head of water over a rectangular notch is 900mm and discharge is 300 litres/s. Find the length of the notch if $C_d = 0.6$.
6. Find the head lost due to friction in a pipe of 300mm diameter and length 50m through which water is flowing at a velocity of 3m/s using Darcy's formula. Take υ for water as 0.01 stokes.
7. A rectangular channel of width 4m is having a bed slope of 1 in 1500. Find the maximum discharge through the channel if C = 50

(5 x 6= 30)

PART – C

Maximum marks: 60

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

UNIT – I

III. (a) Calculate the pressure of the fluid in the pipe, given the following:

The right limb of U-tube manometer containing mercury is open to the atmosphere, while the left limb is connected to a pipe in which a fluid of density 900kg/m^3 is flowing. The centre of the pipe is 12cm below the level of mercury in the right limb. The difference of mercury levels in the two limbs is 20cm. (7)

(b) Water is flowing through a pipe of 5 cm diameter under a pressure of 29.43 N/cm^2 (gauge) and with a mean velocity of 2.0 m/s. Find the total head or total energy per unit weight of the water at a cross-section, which is 5 m above the datum line. (8)

OR

IV. (a) The diameters of a pipe at sections 1 and 2 are 15cm and 10cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 2 is 5m/s. Also determine the velocity at section1. (7)

(b) Derive an expression for total pressure on a vertical plane surface immersed in liquid. (8)

UNIT – II

V. (a) Differentiate between centrifugal pumps and reciprocating pumps. (7)

(b) The head of water over an orifice of diameter 40 mm is 10 m. Find the actual discharge and actual velocity of the jet at vena-contracta. Take C_d = 0.6 and C_c = 0.98. (8)

OR

VI. (a) An internal mouthpiece of 80 mm diameter is discharging water under a constant head of 8 metres. Find the discharge through mouthpiece, when

(i) The mouthpiece is running free, and

(ii) The mouthpiece is running full. (7)

(b) Derive the expression for discharge through a large rectangular orifice. (8)

UNIT – III

VII. (a) Derive the expression for discharge over a rectangular notch. (7)

(b) Find the discharge over a rectangular weir of length 100 m. The head of water over the weir is 1.5 m. The velocity of approach is given as 0.5 m/s. Take $C_d = 0.60$. (8)

OR

VIII. (a) Define 'end contraction' in a weir with the help of a neat figure. Explain the effect of end contractions over discharge of a rectangular weir. (7)

(b) Find the discharge through a trapezoidal notch which is 1 m wide at the top and 0.40 m at the bottom and is 30 cm in height. The head of water on the notch in 20 cm. Assume C_d for the rectangular portion = 0.62 while for triangular portion = 0.60. (8)

UNIT – IV

IX. (a) Derive the conditions for a most economical rectangular section. (7)

(b) A trapezoidal channel has side slopes 1 horizontal to 2 vertical and the slope of the bed is 1 in 1500. The area of the section is 40 m^2. Find the dimensions of the channel if it is most economical. (8)

OR

X. (a) Explain about total energy line and hydraulic gradient line. (7)

(b) Find the discharge through a rectangular channel of width 2m, having a bed slope of 4 in 8000. The depth of flow is 1.5m and take value of N in Mannin's formula as 0.012. (8)
