

FOURTH SEMESTER DIPLOMA EXAMINATION IN CIVIL ENGINEERING
APRIL - 2017

HYDRAULICS

[Maximum Marks: 100]

[Time: 3 Hours]

PART- A
(Maximum Marks: 10)

Marks

- I. Answer the following questions in one or two sentences. Each question carries two marks.
1. Define Hydraulics
 2. Distinguish between absolute pressure and gauge pressure
 3. Name the hydraulic coefficients and show their relation
 4. Define velocity of approach
 5. List the main components of Pelton wheel (5x2=10)

PART - B
(Maximum Marks: 30)

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

1. A Differential U-tube manometer connects two pressure pipes A and B. The pipe A contains carbon tetrachloride having a specific gravity 1.6 under a pressure of 120kPa. The pipe B contains oil of specific gravity 0.8 under a pressure of 200kPa. the pipe A lies 2.5m above pipe B. Find the difference in mercury level, assuming the left limb mercury level is coinciding with the centre of pipe B.
2. A horizontal venturimeter 160mmx80mm used to measure the flow of an oil of specific gravity 0.8. Determine the deflection of mercury, if the discharge of the oil is 50 lit/sec.
3. List the difference between Impulse turbine and Reaction turbine.
4. With the help of a neat sketch, describe the working of Centrifugal pump.
5. Write the functions of Draft tube. List the classifications.
6. Define and explain the terms Total energy line and Hydraulic gradient line.
7. Explain about the channels of most economical cross section (5x6=30)

PART - C
(Maximum Marks: 60)

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

UNIT-I

- III. a) Explain how vacuum pressure can be measured with the help of U-tube Manometer(6)
- b) A caisson for closing the entrance to a dry dock is of trapezoidal form 16m wide at the top and 10m wide at the bottom and 6m deep. Find the total pressure and centre of pressure on the caisson, if the water on the outside is just level with the top, and dock is empty. (9)

OR

- IV. a) State and prove Bernoulli's equation. What are its limitations? (10)
- b) A pipeline carrying oil of specific gravity 0.87, changes in diameter from 200mm at a position A to 500mm at a position B, which is 4m at a higher level. If the pressure at A and B are 9.81N/cm² and 5.886N/cm² respectively and the discharge is 200 litres/s. Determine the loss of head and direction of flow. (5)

UNIT-II

V. a) With the help of neat sketch explain the working of a single acting reciprocating pump. (8)

b) A tank has two identical orifices in one of its vertical sides. The upper orifice is 1.5m below the water surface and the lower one is 3m below the water surface. Find the point, at which the two jets will intersect, if the coefficient of velocity is 0.92 for both the orifices. (7)

OR

VI. a) Derive an expression for time of emptying a tank through an orifice at its bottom. (10)

b) An internal mouthpiece of 100mm diameter is discharging water under a constant head of 5m. Find the discharge through the mouthpiece, when
a. The mouthpiece running free and b. The mouthpiece running full. (5)

UNIT - III

VII. a) What are the advantages of triangular notch over rectangular notch? (7)

b) A rectangular channel 2m wide carries a maximum discharge of 300 litres/s and a minimum of 150 litres/s. It discharges through a 120° angle V-notch. At what level from the channel bed, if the notch be placed to give the maximum depth of 1m for the channel? What is the maximum depth of water in the Channel? Assume 0.6 for discharge coefficient. Neglect velocity of approach. (8)

OR

VIII. a) Derive an empirical formula for discharge over triangular notch. (7)

b) A reservoir has a catchment area of 25 sq. kilometers. The maximum rainfall over the area is 2.5 cm per hour, 40% of which flows to the reservoir over a weir. Using Franci's formula finds the length of the weir. The head of water over the weir should not exceed 80 cm. (8)

UNIT - IV

IX a) Explain major energy losses and minor energy losses in pipes. (8)

b) Determine the rate of flow of water through a pipe of 20cm dia. and length 50m when one end of the pipe is connected to a tank and other end is open to the atmosphere. The pipe is horizontal and the height of water in the tank is 4m above the centre of pipe. Consider all minor losses, take $f=0.009$ (7)

OR

X. a) Derive an expression for the discharge through a channel by Chezy's formula (7)

b) A trapezoidal channel has side slopes 1 to 1. It is required to discharge $13.75\text{m}^3/\text{s}$ of water with a bed gradient of 1 in 1000. If unlined the value of Chezy's C is 44. If lined with concrete, its value is 60. The cost per m^3 of excavation is 4 times the cost per m^2 of lining. The channel is to be the most efficient one. Find whether the lined canal or unlined canal will be cheaper. What will be the dimensions of that economical canal. (8)