

FOURTH SEMESTER DIPLOMA EXAMINATION IN CIVIL  
ENGINEERING — MARCH, 2015

**HYDRAULICS**

[Time : 3 hours

(Maximum marks : 100)

Marks

PART—A

(Maximum marks : 10)

I Answer the following questions in one or two sentences. Each question carries 2 marks.

1. Define surface tension.
2. What is centre of pressure ?
3. Explain the functions of Draft Tube.
4. What is cippoletti weir ?
5. What is meant by most economical channel section ? (5x2=10)

PART—B

(Maximum marks : 30)

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

1. A circular plate 2m diameter is submerged in water. The greatest and least depths of the plate are 2m and 1m respectively, find total pressure on the face of the plate and position of centre of pressure.
2. Derive the equation of continuity.
3. Water discharges at the rate of 98.2 liter per second through a 120mm diameter vertical sharp edged orifice under a constant head of 10m. A point on the jet measured from the venacontracta has co-ordinates of 4.5m horizontal and 0.54m vertical. Find the values of  $C_v$ ,  $C_c$  and  $C_d$  of the orifice.
4. A submerged sharp crested weir 0.8m high stands clear across a channel having vertical sides and a width of 3 meters. The depth of water approach is 1.25m and 10m downstream from the weir the depth of water is 1 meter. Determine the discharge over the weir in liters per seconds. Take  $C_d = 0.6$ .

5. Find the length of cippoletti weir required for a flow of 425 liters per second, if the head of water is not to exceed  $1/10^{\text{th}}$  of length. Use Francis formulae for the weir.
6. Water is flowing through a pipe 1500 meter long with a velocity of 0.8m/second. What should be the diameter of pipe if the loss of head due to friction is 8.7 meter? Take  $f$  for the pipe as 0.01.
7. Water is flowing at the rate of 16.5 cubic meter/second in an earthen trapezoidal channel with a bed width 9m. Water depth is 1.2m and side slope is 1 : 2 calculate the bed slope if the value of  $C$  in Chezy's formulae is 49.5.

(5x6=30)

## PART—C

(Maximum marks : 60)

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

## UNIT – I

- III (a) A simple manometer containing mercury is used to measure the pressure of water flowing in a pipeline. The mercury level in the open tube is 60mm higher than that in the left tube. If the height of water in the left tube is 50mm, determine the pressure in the pipe in terms of head of water. 8
- (b) Explain the different types of mechanical gauges. 7

OR

- IV (a) A rectangular plate 2m wide and 4m deep is immersed in water in such a way that its plane makes an angle of  $25^\circ$  with the water surface. The least depth of plate is 1.8m below water surface. Determine the total pressure on one side of the plate and the position of centre of pressure. 8
- (b) Derive an equation to measure the quantity of water flowing through a venturimeter. 7

## UNIT – II

- V (a) Obtain an expression for the time of emptying a circular horizontal tank through an orifice at its bottom. 8
- (b) A tank has an upper cylindrical portion of 3m diameter and 4m high with a hemispherical base. The cylinder is full of water. Determine the time taken to empty it through an orifice of cross sectional area  $8000\text{mm}^2$  at its bottom. Take  $C_d = 0.62$ . 7

OR

- VI (a) Obtain the expression for loss of head due to sudden contraction of area. 8
- (b) What are the differences between centrifugal pump and reciprocating pump? 7

## UNIT – III

- VII (a) Derive an equation for discharge over a triangular Notch. 8
- (b) A weir 36m long is divided into 12 equal bays by vertical posts each of 600mm width. Determine the discharge over the weir if the head over the crest is 1.2m and the velocity of approach is 2m/second. 7

OR

- VIII (a) Derive an equation for the discharge over a cippoletti weir. 8
- (b) Write short notes on the following with sketches :
- (i) Penstock (ii) Surge tank 7

## UNIT – IV

- IX (a) Derive Chezy's formulae for loss of head in pipes. 8
- (b) A trapezoidal channel has side slopes 2 vertical to 3 horizontal. It is discharging water at the rate of 20 cumecs with a bed slope 1 in 2000. Design the channel for its best form. Use Mannings formula taking  $N = 0.01$ . 7

OR

- X (a) Water flows through a pipe of 200mm in diameter 60m long with a velocity of 2m/second. Find the loss of head due to friction :
- (i) by using Darcy's formula assuming  $f = 0.005$
- (ii) by using Chezy's formula assuming  $C = 55$  8
- (b) Derive the conditions for most economical cross section of a rectangular channel. 7

Part - III

171. (a) Derive an equation for discharge over a triangular notch.  
(b) A weir 10m high is provided with 12 equal bays by vertical posts each of 0.05m width. Assuming the discharge over the weir to be 1000 cumecs, find the depth of approach to the weir.

OR

172. (a) Derive an equation for the discharge over a Cipolletti weir.  
(b) A weir 10m high is provided with 12 equal bays by vertical posts each of 0.05m width. Assuming the discharge over the weir to be 1000 cumecs, find the depth of approach to the weir.

Part - IV

173. (a) Derive an equation for the discharge over a broad crested weir.  
(b) A weir 10m high is provided with 12 equal bays by vertical posts each of 0.05m width. Assuming the discharge over the weir to be 1000 cumecs, find the depth of approach to the weir.

174. (a) Derive an equation for the discharge over a narrow crested weir.  
(b) A weir 10m high is provided with 12 equal bays by vertical posts each of 0.05m width. Assuming the discharge over the weir to be 1000 cumecs, find the depth of approach to the weir.

175. (a) Derive an equation for the discharge over a submerged weir.  
(b) A weir 10m high is provided with 12 equal bays by vertical posts each of 0.05m width. Assuming the discharge over the weir to be 1000 cumecs, find the depth of approach to the weir.

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