

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/  
MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2018

**HYDRAULICS**

[Time : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

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

1. Define surface tension.
2. Compare orifices and mouth pieces.
3. State Pascal's law.
4. Define notch.
5. State most economical channel section.

(5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. A rectangular notch 0.5 meters wide has a constant head of 400mm. Find the discharge over the notch, if  $C_d = 0.62$ .
2. Discuss the function of  
(i) Penstock      (ii) Anchor block      (iii) Tail race
3. Under a laboratory test over a right angled 'V' notch 40 litres of water is collected in one minute under a head of 45 mm. Calculate the co-efficient discharge of the notch.
4. Discuss the hydraulic gradient line and total energy line with sketch.
5. A venturi meter has an area ratio of 9 to 1, the large section being 300mm. During the flow the recorded pressure head in the large section is 6.5m and that at the throat 4.25 meters. If the meter co-efficient  $C = 0.99$ , compute the discharge through the meter.
6. Discuss pumps, list the types of pumps, and explain the working principle of centrifugal pump.
7. A cement-lined rectangular channel 6 meters wide carries water at the rate of  $30 \text{ m}^3/\text{sec}$ . Find the value of Manning's constant, if the slope required to maintain a depth of 1.5m is  $1/625$ .

(5×6 = 30)

## PART — C

(Maximum marks : 60)

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

## UNIT — I

- III (a) A vertical sluice gate 3 meter wide and 2.5 meter deep contains water on both of its sides on the upstream side, the water is 5 m deep and on the downstream side it is 2 m deep from the bottom of the sluice. What is the resultant pressure on the gate ? 7
- (b) An orifice meter consisting of 100 mm diameter orifice in a 250 mm diameter pipe has co-efficient equal to 0.65. The pipe delivers oil specific gravity 0.8. The pressure difference on the two sides of the orifice plate is measured by a mercury oil differential manometer. If the differential gauge reads 80 mm of mercury, calculate the rate of flow in litres/second. 8

OR

- IV (a) A rectangular opening in a vertical reservoir wall is 1 meter wide and 3.5 m deep and its top edge is 9.5 m below water level. Find the total pressure on the gate and also its point of application. 7
- (b) The diameter of a pipe changes from 200 mm at a section 5 meters above datum to 50 mm at a section 3 meters above datum. The pressure of water at first section is 500 kpa. If the velocity of flow at the first section is 1 m/s, determine the intensity of pressure at the second section. 8

## UNIT — II

- V (a) In performing an experiment to determine the different co-efficient of a sharp edged orifice, a jet of water issuing horizontally from an orifice of 30mm dia. Under a constant head of 6.5 m fell 3 m vertically and struck ground at 8.5 m horizontally from vena contracta. The time required to discharge 250 litres of water was 50 sec. Find the hydraulic co-efficients  $C_c$ ,  $C_v$ ,  $C_d$  7
- (b) An internal mouth piece of 80mm diameter is discharging water under a head of 4m. Find the discharge in litres/sec through the mouth piece, when  
(i) the mouth piece is running free and (ii) the mouth piece is running full. 8

OR

- VI (a) Discuss jet pump and deep well pump. 7
- (b) Explain the working of Francis turbine and Kaplan turbine. 8

## UNIT — III

- VII (a) Derive the expression of discharge over a triangular notch. 7
- (b) A trapezoidal notch of 1.2 m wide at the top and 450 mm at the bottom is 300 mm high. Find the discharge through the notch, if the head of water is 225 mm. Take coefficient of discharge as 0.6 8

OR

- VIII (a) A rectangular weir 6m long is discharging water under a head of 300mm. Calculate the discharge over the weir by using (i) Francis formula  
(ii) Bazin's formula 7
- (b) Water flows over a rectangular notch of 1 meter length over a depth of 150 mm then the same quantity of water passes through a triangular right-angled notch. Find the depth of water through the notch. Take the co-efficients of discharges for the rectangular and triangular notch as 0.62 and 0.59 respectively. 8

## UNIT — IV

- IX (a) An earthen channel with a 3m wide base and side slope 1:1 carries water with a depth of 1m. The bed slope is 1 in 1600. Estimate the discharge, take value of N in Manning's formula as 0.04. 7
- (b) An open channel of rectangular cross section with horizontal base and vertical sides is built through rock which is not lined. The canal is 6m deep and 9m wide, while the slope of the bed is 1 in 1000. What will be the discharging capacity of the canal? If  $N = 0.0293$  in the Kutters formula. 8

OR

- X (a) Water at the rate of 0.4 cumec flows through a 1 meter diameter vitrified sewer, when the sewer pipe is half full. Find the slope of the sewer, if Manning's Constant N is 0.013. 7
- (b) A rectangular channel has a cross-section of 8 square meters. Find its size and discharge through the most economical section, if bed slope is 1 in 1000. Take  $C = 55$ . 8
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