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C09–C–304

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BOARD DIPLOMA EXAMINATION, (C–09)

MARCH/APRIL—2018

DCE—THIRD SEMESTER EXAMINATION

HYDRAULICS

Time : 3 hours] [*Total Marks* : 80

PART—A 3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Estimate the capillary rise or depression in a tube of 3 mm dia when the tube is immersed in *(a)* water and *(b)* mercury. Surface tension for water and mercury at 20 °C is 0·075 N/m and 0·52 N/m respectively.

2. What is a piezometer? Write any two limitations of piezometer.

3. The diameter of a pipe at sections (1) and (2) are 12 cm and 20 cm respectively. Find the discharge through the pipe if the velocity of water at section (1) is 2·5 m/sec. Also determine the velocity at section (2).

4. State the equation for discharge through internal mouthpiece for different conditions.

5. Calculate the discharge over a rectangular notch whose length is 2 m and head over the notch is 0·3 m. Take, C_d 0 62.

6. Define weir. State the classification of weirs based on shape of the opening and shape of the crest.

7. Define laminar flow and turbulent flow in pipe flow.

8. What do you understand by the term 'most economical section' of a channel?

9. What is the difference between single-stage and multi-stage pumps?

10. Explain, with neat sketch, surge tank and pen stock.

PART—B 10×5=50

Instructions : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. Each gate of a lock 6 m high and 5 m wide is supported on one side by two hinges each 0·5 m from top and bottom respectively. The angle between the gates in closed position is 120°. If the depths of water on the two sides are 5 m and 1·25 m respectively, find—

(a) the position of the resultant water pressure on each gate;

(b) the magnitude and reaction between the gates;

(c) the magnitudes and directions of reactions at the hinges.

Assume the reaction between the gates to be in the same horizontal plane as that of the resultant water pressure.

12. A horizontal venturi meter 30 cm × 15 cm is used to measure the flow of water. Determine the deflection of the water mercury gauge, if the discharge of water is 110 lit/sec. Assume C_d 0 96.

13. Derive an expression for discharge through a rectangular orifice.

14. A weir 50 m long has 70 cm height of water above the crest. Calculate the maximum discharge using Francis formula over the weir if the velocity of approach is 1·5 m/s. Assume coefficient of discharge as 0·62. Neglect the end contractions, if any.

15. *(a)* Determine the rate of flow of water through a pipe of diameter 20 cm and length 50 cm when one end of pipe is connected through a tank and the other end is opened. The pipe is horizontal and the height of water in the tank is 4 m above the centre of pipe. Consider all minor losses and take f 0 009.

(b) State the formula for loss of head at entrance.

16. A trapezoidal channel has side slopes 2 V to 1 H. It is discharging water at the rate of 22·0 m^3 / sec with a bed slope 1 in 2000. Design the channel for the most economical cross-section using Manning's formula. Take, N 0 01.

17. Explain Francis turbine with a neat sketch.

18. *(a)* Define and sketch the hydraulic gardient line and total energy line for a horizontal pipe of uniform cross-section. Take the loss of head due to friction into consideration.

(b) A rectangular channel is 4 meters deep and 6 meters wide. Find the discharge through channel when it runs full. Take slope of the bed as 1 in 1000 and Chezy's constant as 50.

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