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C14–C–303

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BOARD DIPLOMA EXAMINATION, (C–14)

MARCH/APRIL—2016

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.

1. Determine the minimum diameter of the glass tube if the capillary rise in the glass tube is not to exceed 0·2 mm of water. [Take surface tension of water ( ) as 0·0725 N/m]

2. Define the following :

(a) Gauge pressure

(b) Vacuum pressure

3. Define the following :

(a) Steady flow

(b) Uniform flow

(c) Laminar flow

4. An internal mouthpiece of 100 mm diameter is discharging water under a constant head of 4 m. Find the discharge through the mouthpiece if running full. [Take C_d 0 707]

5. Define the following :

(a) Velocity of approach

(b) End contraction

6. What is Cipolletti weir? Give the equation for discharge of it.

7. What is total energy line (TEL) in a pipe flow?

8. A rectangular channel has 50 m^2 area. If the channel section is to be most economical, calculate the bed width and depth.

9. State any three main parts of a Francis turbine.

10. Sketch a typical hydroelectric installation and name the parts.

PART—B

10×5=50

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

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

11. The end gates of a lock are of 10 m height at an included angle of 120° when closed. The width of the lock chamber is 6 m and each gate is supported on two hinges placed at 500 mm from the top and bottom of the gate. If the water levels are 6 m and 4.2m on upstream and downstream side respectively, determine the magnitudes of forces on the hinges due to water pressure.

12. *(a)* Write any three assumptions of Bernoulli's equation. 3

(b) A pipe of 0·3 m diameter carries an oil of specific gravity 0·9 at the rate of 120 lit/sec. The pressure at a point *A* in the pipe is 24·5 kN/m^2 (gauge pressure). If the point *A* is 5 m above the datum line, calculate the total head (in metres) of oil. 7

13. *(a)* Define coefficient of contraction. 2

(b) Water flows through a circular orifice of 2.5 mm diameter provided in the side of a tank under a constant head of 800 mm. The coordinates at a certain point of the jet are 300 mm from the vena contracta horizontally and 32 mm vertically below the centerline of the orifice. The water is collected in a tank of size 600 mm × 600 mm and collected. The water level in the collecting tank rises by 33 mm in 10 seconds. Find C_c, C_v and C_d. 8

14. A broad crested weir 20 m long has a head of 700 mm over the crest. The width of approach channel is 40 m and its depth below the crest of weir is 600 mm. Calculate the discharge over the weir—

(a) by considering velocity of approach;

(b) by neglecting velocity of approach.

[Take C_d as 0·95] 5+5

15. Water flows through a pipe 200 mm diameter, 60 m long with a velocity of 2.5 m/sec. Find the head loss in friction using *(a)* Darcy's formula and *(b)* Chezy's formula. Assume Chezy's constant as 55.

16. *(a)* Find the diameter of uniform pipe to replace a compound pipeline having the following elements : 5

(i) 1000 m of 500 mm diameter

(ii) 500 m of 400 mm diameter

(iii) 250 m of 300 mm diameter

(b) Define the following : 1×5=5

(i) Depth of flow

(ii) Wetted perimeter

(iii) Wetted area

(iv) Hydraulic radius

(v) Hydraulic depth

17. A trapezoidal channel carrying water has bottom width of 4 m and side slopes of 1 horizontal to 2 vertical. If the bed slope of the channel is 1 in 500, find the discharge through the channel. Assume Manning's n = 0·03 in Manning's formula if depth of flow is 3·2 m.

18. Distinguish between centrifugal pump and reciprocating pump.

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