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IV Semester Diploma Examination, Oct./Nov.-2019

HYDRAULICS

Time : 3 Hours]

[Max. Marks : 100

Instruction : Answer any six questions from Part – A and seven questions from Part – B.

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PART – A

1. Define :

5 × 1 = 5

(i) Compressibility

(ii) Viscosity

(iii) Atmospheric pressure

(iv) Specific weight

(v) Mass Density

BETA CONSOLE



2. Explain with neat sketch U-tube differential manometer.

5

3. State Bernoulli's theorem and its limitations.

5

4. State forms of energies in a flowing liquid. Write expression for total energy.

5

5. List the advantages of a triangular notch over a rectangular notch.

5

6. Explain the surge tank with neat sketch.

5

7. List any five losses in flow through pipes. 5
8. Define most economical channel section. State conditions for the most economical trapezoidal section. 5
9. With usual notations, give Chezy's formula and Manning's formula for uniform flow in channel section. 5

PART – B

10. (a) Define total pressure and centre of pressure. 2
- (b) A circular plate of diameter 2.7 m is placed vertically in water in such a way that the centre of gravity of plate is at a distance of 2.5 m below the free surface. 8
- Find :
- (i) Total pressure
- (ii) Position of centre of pressure
11. (a) Differentiate between simple manometer and differential manometer. 3
- (b) A U-tube differential manometer connects two pipes A and B. Pipe A contains CCl_4 (Sp.gr. = 1.59) under 130 kN/m^2 gauge pressure. Pipe B contains water under 200 kN/m^2 gauge pressure. Pipe A is 2.5 m above pipe B. The manometer contains mercury. Calculate the difference in mercury level. The level of mercury connected to pipe A is in level with centre of pipe B. 7
- Take sp.gr. of mercury = 13.6 and that of water = 1.
12. (a) Water flowing through a tapered pipe having diameter 150 mm and 50 mm. Determine the velocity and rate of discharge at the smaller end, if the velocity of water at the larger end is 2.5 m/sec. 4
- (b) A venturimeter with 150 mm diameter inlet and 100 mm throat is used for measuring the flow of oil of specific gravity 0.8. The differential manometer shows a gauge difference of 250 mm. Find the discharge in litres / minute. Take $C_d = 0.98$. 6

3. (a) Differentiate between 4
- (i) Uniform flow and non-uniform flow
- (ii) Laminar flow and Turbulent flow
- (b) A pipe 300 m long has a slope of 1 in 100 and tapers from 1.0 m diameter at the higher end to 0.50 m at the lower end. The quantity of water flowing is 900 litres/sec. If the pressure at the higher end is 80 kPa. Find the pressure at the lower end. 6
14. (a) Define Hydraulic coefficients and give the relation between them. 4
- (b) A jet of water from a sharp vertical orifice under a constant head of 0.95 m. At a certain point of jet, the horizontal and vertical co-ordinates are measured from the vena-contracta are 0.55 m and 0.080 m respectively. Determine hydraulic coefficients C_v and C_c , if $C_d = 0.60$. 6
15. (a) Explain with neat sketch discharge through external mouthpiece. 4
- (b) Find the discharge over a triangular notch of angle 60° , when the head over the triangular notch is 0.30 m. Assume $C_d = 0.60$. 6
16. (a) What is a cippoletti weir ? How does it differ from a rectangular weir ? 3
- (b) Determine the height of rectangular weir of length 5 m to be built across a rectangular channel. The maximum depth of water on the upstream side of the weir is 1.5 m and discharge is $2 \text{ m}^3/\text{sec}$. Take $C_d = 0.6$ and neglect end contractions. 7
17. (a) Define Hydraulic gradient line and total energy line. 2
- (b) A reservoir has been built 4 km away from a college campus having 5000 inhabitants. Water is supplied from the reservoir to the campus. If it is estimated that each inhabitant will consume 200 litres of water per day and that Half of the daily supply is pumped within 10 hours. Calculate the size of the supply main, if the loss of head due to friction in pipe is 2.0 m, $f = 0.008$. 8

18. A trapezoidal channel has side slopes 3 Horizontal to 4 vertical and the slope of its bed is 1 in 1800. Determine the economical section of channel, if it is to carry water at $0.60 \text{ m}^3/\text{sec}$. Take Chezy's constant as 60. 10
19. (a) Compare between centrifugal pump and reciprocating pump. 4
- (b) Explain with neat sketch construction and working of pelton wheel (Turbine). 6

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