C20-M–**403**

7456

BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER/NOVEMBER—2024

DME – FOURTH SEMESTER EXAMINATION

HYDRAULICS AND FLUID POWER SYSTEMS

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

PART—A 3×10=30

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

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

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

1. Define the following fluid properties *(a)* Surface tension and *(b)* Capillarity.

2. Convert a pressure of 1·5 bar into *(a)* kilo Pascal and *(b)* Meters of water.

3. Define steady flow and unsteady flow.

4. Water is flowing through a pipe whose diameter changes gradually from 25 cm to 50 cm. The mean velocity of flow at smaller end is 20 m/s. Find the velocity at larger end.

5. Name any six minor losses in pipe flow.

6. Write the expression for force exerted by jet of water on an inclined fixed flat plate in the direction of jet and explain the terms.

7. What is draft tube? State its functions.

8. Define the following terms with reference to hydraulic turbines *(a)* Unit discharge and *(b)* Unit power.

9. What is cavitation? State its effects in centrifugal pumps.

10. State any three advantages of using hydraulic power over pneumatic power.

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

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

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

11. Two horizontal flat plates are placed 0·15 mm apart and the space between them is filled with an oil of viscosity 1 Poise. The upper plate of area 1·5 m^2 is required to move with a speed of 0·5 m/s relative to lower plate. Determine the necessary force and power required to maintain the speed.

(OR)

A simple U-tube manometer containing mercury (Specific gravity 13·6) is connected to a pipe containing oil (Specific gravity 0·85) as shown in figure. The right limb of the manometer is open to atmosphere. Determine the absolute pressure of oil in the pipe; assume atmospheric pressure as 1 bar.
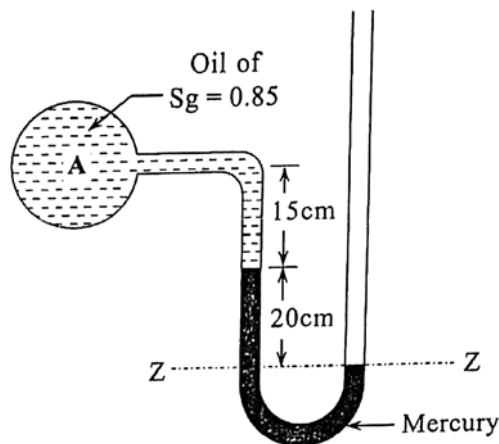
12. A 15 m long pipe is inclined at an angle of 30° with horizontal. The smaller section of the pipe is at lower level and is 100 mm in diameter and the larger section of the pipe is 300 mm in diameter. Determine the difference of pressure between the two sections in N/m^2, if the pipe is uniformly tapered and velocity of water at the smaller section is 2 m/s.

(OR)

A horizontal venturimeter of 300 mm × 150 mm is used to measure the flow water. The reading of differential manometer connected to the inlet and throat is 200 mm of mercury. Determine the rate of flow, if coefficient of discharge of venturimeter is 0·98.

13. Water is supplied from a reservoir through a 300 mm diameter and 600 m long pipe to a turbine which is situated 108 m below the free surface of water in reservoir. Discharge through the pipe is 81 lit/sec. Find the head lost and power transmitted by the pipe. Take specific weight of water as 9·81 kN/m^3 and f = 0·03.

(OR)

Water is flowing through a pipe of length 1500 m transmits a maximum power of 300 kW. The pressure head at inlet of pipe is 509·7 m. Determine the diameter of pipe, if specific weight of water is 9·81 kN/m^3 and f = 0·03.

14. A jet of area 78·54 cm^2 moving with a velocity of 12 m/s impinges on a series of flat plates mounted on a wheel and moving with a velocity of 8 m/s. Determine *(a)* Force exerted by jet, *(b)* Work done/sec and *(c)* Efficiency of jet.

(OR)

Explain the working of a single acting reciprocating pump with a legible sketch.

15. Describe various components of a pneumatic power system with a schematic diagram.

(OR)

Explain the open loop and closed loop systems used in hydraulic power systems with the help of legible sketches.

PART—C   10×1=10

Instructions : (1) Answer the following question.

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

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

16. A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water flowing at the rate of 700 lit/sec operating under a head of 30 m. The buckets deflect the jet through an angle of 160°, by assuming C_v = 0·98 calculate *(a)* Runner power and *(b)* Hydraulic efficiency.

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