7456

BOARD DIPLOMA EXAMINATION, (C-20)

NOVEMBER/DECEMBER—2022

DME – FOURTH SEMESTER EXAMINATION

HYDRAULICS 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.

(4) Assume acceleration due to gravity as 9·81 m/s^2.

1. Define the following fluid properties :

(i) Capillarity *(ii)* Surface Tension.

2. Find the height of water column and height of mercury column corresponding to a pressure of 72 kN.m^2.

3. State any three assumptions made in Bernoulli's equation.

4. Water is flowing through a pipe of 0·5 m diameter with an averge velocity of 2 m/s. What is the rate of discharge of water? The same flow then passes through another section where the diameter is 1m. What is the average flow velocity at this section?

5. Write Darcy's formula for head lost due to friction and specify various terms used in it.

6. What is the purpose of draft tube in hydraulic turbine?

7. A jet of water moving with a velocity of 25 m/sec strikes normally on a flat plate. The jet diameter is 60 mm. Determine the force on the plate, when the plate is moving in the direction of jet with a velocity of 5m/sec.

8. Define the following terms with respect to turbines :

   (i) Hydraulic efficiency *(ii)* Mechanical efficiency *and (iii)* Volumetric efficiency.

9. List out the effects of cavitation in pumps.

10. Write any 3 differences between Hydraulic and Pneumatic Power systems.

PART—B

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

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

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

11. *(a)* A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0·8 is flowing and maintaining at vacuum pressure. The other end of the manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 35 cm and the height of fluid in the left limb from the centre of pipe is 12 cm below. Draw the respective sketch showing the arrangement of U-tube mercury manometer connected to the pipeline and indicate the levels of various fluids in it. 5+3=8

(OR)

(b) Explain how the difference of pressure is measured with differential manometer and derive the expression for it using a legible sketch.

5+3=8

12. *(a)* A 30 cm diameter pipe conveying water, branches into two pipes of diameter 20 cm and 15 cm respectively. If the average velocity in 30 cm diameter pipe is 2·5 m/s, find the discharge in this pipe. Also determine velocity in 15 cm diameter pipe, if the average velocity in 20 cm diameter pipe is 1·75 m/s.   8

(OR)

(b) A venturi meter has inlet to throat ratio of 8·1. The pipe diameter is 250 mm. During the flow, the pressure head recorded at inlet is 7·5 m and that at the throat is 4 m. If the coefficient of meter is 0·98, calculate the discharge through the meter.   8

13. *(a)* Find the maximum power that can be transmitted to a power station through a hydraulic pipe 3 km long and 25 cm diameter, when the pressure at the power station is 625 kN/m². Take f = 0·008.   8

(OR)

(b) Two reservoirs are connected by a pipeline which is 14 cm in diameter for the first 4·5 m and 24 cm in diameter for the remaining 14·5m. The water surface in upper reservoir is 7m above that in the lower reservoir. Sketch the arrangement and calculate the flow rate through the pipeline. Assume coefficient of friction f = 0·01 for the both the pipes and neglect minor losses.

14. *(a)* List out the differences between Impulse and Reaction turbines in any 8 aspects.   8

(OR)

(b) List out the differences between Centrifugal pump and Reciprocating pump in any 8 aspects.   8

15. *(a)* Draw a circuit diagram of Pneumatic power system and explain any 5 essential components of the system.   3+5=8

(OR)

(b) Briefly explain about Directional control valves, Pressure control valves and Flow control valves in a hydraulic system along with their classification in each case.   3+3+2=8

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. Draw the line diagram, of a Hydroelectric power and state the functions of main components.

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