C20-M–403

7456

BOARD DIPLOMA EXAMINATION, (C-20)

JUNE/JULY—2022

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

1. Define the following fluid properties *(a)* density and *(b)* compressibility.

2. Determine the viscosity of a liquid having kinematic viscosity 6 stokes and specific gravity 1·9.

3. State any three limitation of Bernoulli's theorem.

4. In a pipe of 90 mm diameter water is flowing with a mean velocity of 3 m/s and at a gauge pressure of 425 kN/m^2. Determine the total head, if the pipe is 8 m above the datum line. Neglect friction.

5. A 2·5 km long water main pipe has to carry a discharge of 0·5 m^3/s. If the maximum allowable loss of head due to friction is 25 m. Find the minimum diameter required. Use Darcy's equation. Assume f = 0·0085. Neglect minor losses.

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

7. Derive an expression for the force exerted by a jet of water on an inclined fixed flat plate in the direction of the jet.

8. Draw a line diagram of centrifugal pump and label the parts.

9. What is priming ? Why it is for necessary?

10. List out any six applications of fluid power systems.

PART—B

8×5=40

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

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

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

11. *(a)* Explain a simple U-tube manometer with a legible sketch, and derive an expression for calculating pressure head.

(OR)

(b) A U-tube manometer containing mercury has its right limb open to atmosphere. The left limb is full of water under pressure, the centre of which is in level with the free surface of mercury. Find the pressure of water in the pipe above atmosphere, if the difference of levels of mercury in the limbs is 6·35 cm. 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.

12. *(a)* A pipeline carrying oil (sp.gr.0·85) changes in diameter from 300 mm at position 1 to 600 mm diameter at position 2, which is 6 m at a higher level. If the pressures at positions 1 and 2 are 100 kN/m^2 and 65 kN/m^2 respectively and the discharge is 300 litres/sec. Determine *(a)* Loss of head and *(b)* Direction of flow.

(OR)

(b) In a 100 mm diameter horizontal pipe a venturi meter 0·5 contraction ratio has been fixed. The head of water at the inlet is 3 m (guage). Find the rate of flow for which the throat pressure head will be 2 m of water absolute. The coefficient of discharge is 0·97. Take atmospheric pressure head=10·3 m of water.

13. *(a)* Two reservoirs are connected by a 6000 m long and 1·5 m diameter C.I. pipe with f=0·015. The difference in water levels in two reservoirs is 25 m. Determine the increase in discharge, if the C.I. pipe is replaced with a smooth steel pipe of same size with f=0·0055.

(OR)

(b) A pipe of diameter 300 mm and length 3500 m is used for the transmission of power by water. The total head at the inlet of the pipe is 450 m. Find the maximum power available at the outlet of the pipe, if the value of f=0·0075.

14. *(a)* Explain the working of Francis Turbine with a legible sketc.

(OR)

(b) Explain the working of Double acting reciprocating pump with a legible sketch.

15. *(a)* Draw a legible sketch of hydraulic system and explain the functions of 5 main components.

(OR)

(b) Compare pneumatic system with hydraulic system in any eight aspects.

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 operates under a head of 155 m, diameter of jet is 52 mm, speed ratio is 0·46. Jet is deflected through 165^0 over the buckets. Neglecting friction and other losses, calculate the power output and efficiency. Assume $C_V = 0{\cdot}96$.

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