

7456

BOARD DIPLOMA EXAMINATION, (C-20)

MAY—2023

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 (a) density and (b) compressibility.
2. Find the absolute viscosity of fluid of thickness 0.6 mm between two plates when the moving plate of velocity 5 m/sec is subjected to shear stress of 100 N/mm^2 .
3. State laminar and turbulent flow.
4. The diameters of a tapered pipe at section 1 and 2 are 15 cm and 20 cm respectively. What is the discharge through the pipe if the velocity of liquid at section 2 is 4 m/sec? Also determine the velocity at section 1.
5. State major energy losses and minor energy losses in pipes.
6. Derive the expression for the force of jet exerted on a fixed curved plate.
7. Write any three differences between impulse and reaction turbine.
8. State the function of draft tube in a hydraulic turbine.
9. What is priming in pumps? Why is it necessary?
10. Write any three industrial applications of 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.** (a) Explain the working of differential U-tube manometer with a neat sketch and derive the expression for pressure head.

(OR)

- (b) A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0.8 and having vacuum pressure is flowing. 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 40 cm and the height of fluid in the left from the centre of pipe is 15 cm below.

- 12.** (a) A pipe 200 m long slopes down at 1 in 100 and tapers from 600 mm diameter at the higher end to 300 mm diameter at the lower end and carries 100 litres/sec of oil (sp.gr. 0.8). If the pressure gauge at the higher end reads 60 kN/m^2 , determine velocities at two ends and pressure at the lower end. Neglect all losses.

(OR)

- (b) A venturimeter has inlet to throat area of 8 : 1. The pipe diameter is 300 mm. During the flow, the pressure head recorded at inlet is 7.5 metres and that at the throat is 4 metres. If the coefficient of discharge is 0.99, calculate the discharge through the venturimeter.

- 13.** (a) Two reservoirs are connected by a 5000 m long and 1.5 m diameter CI pipe with $f = 0.01$. The difference in water levels in two reservoirs is 25 metres. Determine the increase in discharge, if the CI pipe is replaced with a smooth steel pipe of same size with $f = 0.005$.

(OR)

- (b) Find the maximum power that can be transmitted to a power station through a hydraulic pipe 3km long and 20 cm diameter, when the pressure at the power station is 600 kN/m^2 . Take $f = 0.0075$.

14. (a) A jet of water 20 mm in diameter, moving with a velocity of 10 m/sec, strikes on a series of vanes moving with a velocity of 3 m/sec. Find (i) force exerted by jet, (ii) work done/sec and (iii) efficiency of the jet.

(OR)

- (b) Explain the working of a single acting reciprocating pump with a neat sketch.

15. (a) Explain hydraulic system with a neat sketch.

(OR)

- (b) Explain (i) open loop system and (ii) closed loop system.

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 is to be designed for a head of 60 m when running at 200 rpm. The pelton wheel develops 95.6475 kW shaft power. The velocity of bucket is 0.45 times the velocity of jet. Overall efficiency is 0.85 and coefficient of velocity is 0.98. Find out (a) diameter of pelton wheel and (b) number of buckets on the wheel.

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