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C09–M–406

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BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2014

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. State any two differences between compressible and incompressible fluids.

2. Draw a neat sketch of venturi meter. State why the angle of divergence is to be maintained.

3. Write the equation for power transmission through pipes and mention what each letter stands for and state their units.

4. A jet of oil of specific gravity 0·8 strikes the fixed plate normally. The jet diameter is 20 cm and its velocity is 10 m/s. Find the force exerted by the jet on the plane.

5. Draw a neat sketch of hydroelectric power plant and indicate the elements of the plant.

6. Why are the blades of Pelton wheel made as double hemispherical shape?

7. What are the applications of reciprocating and centrifugal pumps?

8. What is a hydraulic control valve? State its functions.

9. What is meant by pneumatic system? State any four applications of pneumatic power.

10. State the advantages of hydropneumatic system.

PART—B

10×5=50

Instructions : (1) Answer *any* **five** questions.
(2) Each question carries **ten** marks.
(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. A simple manometer (U tube) containing mercury is connected to a pipe in which an oil of specific gravity 0·8 is flowing. The pressure in the pipe is vacuum. The other end of the manometer is open to the atmosphere. Find the vacuum, pressure in pipe, if the difference of mercury level in the two limbs is 20 cm and the height of oil in the left limb from the center of the pipe is 15 cm below.

12. *(a)* State Bernoulli's theorem. 3

(b) The diameter of a pipe changes from 200 mm at a section 5 m above datum to 50 mm at a section 3 m above datum. The pressure of water at first section is 0·5 N/m^2. If the velocity of flow at the first section is 1 m/s, determine the intensity of pressure at the second section. 7

13. *(a)* Explain the working principle of syphon with a neat sketch.

(b) Water is discharged from a tank maintained at a constant head of 6 m above the exit of a straight 100 cm long pipe. Estimate the rate of flow if the diameter of the pipe is 200 mm. [Take, Darcy's friction factor (f) 0 01]

14. A 20 cm diameter jet of water strikes a curved vane with a velocity of 30 m/s. The inlet vane angle is zero and the outlet angle is 25°. Find the resultant force on the vane—

(a) when the vane is fixed;

(b) when the vane is moving with a velocity of 15 m/s in the direction of jet.

15. A Francis turbine has inlet diameter of 2 m and outlet diameter of 1 m. The breadth at inlet and outlet are 0·2 m and 0·3 m. The speed of turbine is 300 r.p.m. The relative velocity of jet at entrance is 4 m/sec and is radial. Calculate—

(a) absolute velocity of jet at entrance and the angle with the tangent of runner;

(b) discharge;

(c) the velocity of flow at the outlet.

16. A single-acting reciprocating pump has a plunger diameter of 300 mm and stroke 200 mm. If the speed of the pump is 30 r.p.m. and delivers 6·5 lit/sec of water, find the coefficient of discharge and the percentage slip of the pump.

17. *(a)* Draw a neat sketch of hydraulic system.

(b) List the essential components of a hydraulic system and state their functions.

18. Explain the working principle of the following power-operated holding devices with neat sketches :

(a) Pneumatically operated vice

(b) Pneumatic collet chuck

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