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C14–M–**405**

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BOARD DIPLOMA EXAMINATION, (C–14)
OCT/NOV—2016
DME—FOURTH SEMESTER EXAMINATION

FLUID MECHANICS AND HYDRAULIC MACHINERY

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 :   1½+1½=3

    (a) Viscosity

    (b) Specific gravity

2. What is the specific gravity of a liquid whose specific weight is $7 \cdot 5 \, \text{kN/m}^3$?   3

3. List different types of flow (any *six*).   ½×6=3

4. State any three limitations of Bernoulli's theorem.   1×3=3

5. Define *(a)* hydraulic gradient line (HGL) and *(b)* total energy line (TEL).   1½+1½=3

6. Water flows through a pipe 250 mm in diameter and 60 m long with a velocity of 3 m/s. Find the loss of head due to friction by using Darcy's formula $f = 0 \cdot 005$.   3

7. Derive an expression for the force exerted by a jet of water on fixed vertical plate in the direction of the jet. 3

8. Draw the layout of hydroelectric power plant and indicate the elements of the plant. 3

9. State the functions of the following parts of the Pelton wheel :

1½+1½=3

(a) Runner

(b) Breaking jet

10. What is priming and why is it necessary? 3

PART—B 10×5=50

Instructions : (1) Answer *any* **five** questions.

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

(3) Assume suitable data, missing if any.

11. One end of a U-tube manometer is connected to pipeline carrying water and other end is open to atmosphere. The level of mercury in the right limb is 0·12 m above the center of pipe and the level of mercury in the left limb connected to the pipe-line is 0·2 m below the center of the pipeline. Find the pressure of water in the pipe.

12. A water discharge of 100 liters/sec is flowing through a 200 mm diameter main. For measuring the discharge, a venturi meter was employed whose U-tube differential manometer gave a reading of 40 cm of mercury. Determine the diameter of throat, if the coefficient of discharge of the meter is 0·9.

13. A pipe is used for transmission of power of 300 kW under most efficient condition. The length of the pipe is 1500 m, the pressure head at the inlet of the pipe is 509·7 m. Determine the diameter of the pipe. [Take f = 0·03]

14. A jet of water moving with a velocity of 25 m/s strikes normally on a plate. The jet diameter is 60 mm. Determine the force on the plate when *(a)* the plate is fixed and *(b)* the plate is moving in the direction of the jet with a velocity of 5 m/s.   5+5

15. *(a)* Draw the velocity triangles for a jet of water striking a moved curved vane at one trip.   5

   (b) Write any five differences between impulse turbine and reaction turbine.   5

16. A Pelton wheel has a mean bucket speed of 10 m/s with a jet of water flowing at the rate of 700 liters/sec under a head of 30 m. The bucket deflects the jet through an angle of 160°. Calculate the power given by water to the runner and hydraulic efficiency of the turbine. [Take coeffcient of velocity 0·98]

17. A double-acting single-cylinder reciprocating pump has the following specifications :

   Cylinder diameter = 200 mm
   Stroke length = 300 mm
   Gross height to which water is lifted = 20 m
   Speed = 40 r.p.m.

   Find *(a)* theoretical discharge *(b)* theoretical power required to drive the pump and *(c)* coefficient of discharge and slip, if the actual discharge is 12 liters/sec.

18. Explain the working of a centrifugal pump with neat sketch.   5+5=10

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