1128

Code : 9ME-32

Register Number

III Semester Diploma Examination, Nov./Dec., 2014

FLUID MECHANICS & MACHINERY

Time : 3 Hours]

[Max. Marks : 100

Note : (i) Section – I is *compulsory*.

(ii) Answer any **two** full questions in each Sections – II, III & IV.

(iii) Assume missing data if any.

SECTION – I

1. (a) Fill in the blanks :   5
    (i) The pressure measured below atmospheric pressure is known as _____.
    (ii) In a centrifugal pump the liquid enters at _____.
    (iii) If a body floating in a liquid returns to its original position when given a small angular displacement, the body is said to be in stable _____.
    (iv) The falling drop of water becomes sphere due to _____.
    (v) Francis turbine is an example of _____ turbine.

    (b) Define :   5
    (i) Viscosity
    (ii) Dynamic viscosity
    (iii) Kinematic viscosity
    (iv) Surface tension
    (v) Capillarity of fluids

SECTION – II

2. (a) Explain Buoyancy and metacentre.   4
    (b) Explain the relation between vacuum, absolute and atmospheric pressure.   5
    (c) Explain with a neat sketch the Diaphragm pressure gauge.   6

3. (a) State Bernoulli's equation and mention the practical applications of it.   4
    (b) Explain with sketch the Pitot's tube.   5
    (c) A pipe 300 m long has a slope of 1 in 100 and tapers from 1 m diameter at the higher end to 0.5 m diameter at the lower end. The quantity of water flowing is 900 litres per second if the pressure at the higher end is 70 kpa. Find the pressure at the lower end.   6

[Turn over

4. (a) Define loss of head in pipes due to friction.   3

    (b) Explain Hydraulic gradient and Total energy lines with sketches.   6

    (c) Find the maximum power that can be transmitted by a power station through a hydraulic pipe of 3 kilometres long and 200 mm diameter. The pressure of water at the power station is 1500 kpa. Take f = 0.01.   6

SECTION – III

5. (a) What is jet of water ? Explain impact of it.   4

    (b) Derive an expression for the force of jet on an inclined fixed plate.   5

    (c) A 25 mm diameter jet exerts a force of 1 kN in the direction of flow against a flat plate, which is held inclined at an angle of 30° with the axis of the stream. Find the rate of flow.   6

6. (a) What is a turbine ? Give classification of Hydraulic turbines.   4

    (b) What do you mean by efficiency of turbine ? Explain the different types of efficiencies of a Impulse turbine.   5

    (c) A Pelton wheel develops 1500 kW under a head of 120 m and with an overall efficiency of 80%. Find diameter of the nozzle if $C_v = 0.98$.   6

7. (a) Explain Draft tube of a turbine.   4

    (b) Explain criteria for selection of Hydraulic turbines.   5

    (c) A turbine develops 10,000 kW under a head of 25 metres at 130 rpm. What is its specific speed ? What would be its normal speed and output under a head of 20 metres ?   6

SECTION – IV

8. (a) Explain cavitation and its effects in centrifugal pumps.   4

    (b) Explain main parts of centrifugal pump with the neat sketch and label parts.   5

    (c) A centrifugal pump having an overall efficiency of 75% is discharging 30 litres of water per second through a pipe of 150 mm diameter and 125 m long. Calculate the power required to drive the pump, if the water is lifted through a height of 25 m. Take coefficient of friction as 0.01.   6

9. (a) What is slip of reciprocating pump ? Explain negative slip with causes.   4

    (b) Explain Air vessel with diagram.   5

    (c) A double acting reciprocating pump has a stroke of 300 mm and a piston of diameter 150 mm. The delivery and suction heads are 26 m and 4 m respectively including friction heads if the pump is working at 60 rpm. Find power required to drive the pump with 80% efficiency.   6

10. Write short notes of any **three** of the following : 3×5

     (a) Jet pump

     (b) Casing of centrifugal pumps

     (c) Pitot tube

     (d) Pascal's law

―――――――――