

**DIPLOMA IN CIVIL ENGINEERING (DCLE(G)) /
DIPLOMA IN MECHANICAL ENGINEERING
(DME)**

Term-End Examination

June, 2016

00280

BET-037 : FLUID MECHANICS

Time : 2 hours

Maximum Marks : 70

Note : *All questions are compulsory. Use of scientific calculator is permitted.*

1. Choose the correct answer from the given four alternatives. $7 \times 2 = 14$
- (a) A fluid is a substance that
- (i) cannot withstand any shear force.
 - (ii) cannot remain at rest under the action of a shear force.
 - (iii) flows in the absence of external forces.
 - (iv) is incompressible and inviscid.
- (b) A solid body sinks in a fluid when
- (i) the specific gravity of its material is greater than unity.
 - (ii) the buoyancy force does not pass through the metacentre.
 - (iii) the weight of the fluid displaced is less than the weight of the body.
 - (iv) the metacentre lies below the centre of gravity.

- (c) For two pipes arranged in series,
- (i) the flow may be different in different pipes.
 - (ii) the head loss per unit length must be more in a smaller pipe.
 - (iii) the velocity must be the same in all pipes.
 - (iv) the head loss must be the same in all pipes.
- (d) The Reynolds number is defined as the ratio of
- (i) gravity force to viscous force
 - (ii) viscous force to inertia force
 - (iii) inertia force to viscous force
 - (iv) gravity force to inertia force
- (e) Select the correct statement.
- (i) Viscosity of a gas increases with temperature.
 - (ii) Density of a gas increases with temperature.
 - (iii) Surface tension of a liquid increases with temperature.
 - (iv) Bulk modulus of elasticity is independent of temperature.
- (f) The buoyant force acting on a floating body passes through the
- (i) metacentre of the body
 - (ii) centre of gravity of the body
 - (iii) centroid of volume of the body
 - (iv) centroid of the displaced volume

- (g) Of the various methods of measuring discharge through a pipeline, the one with the least loss of energy and direct reading is
- (i) by means of a venturimeter
 - (ii) by means of an orifice meter
 - (iii) by means of a flow nozzle
 - (iv) by traversing a pitot-static probe

2. Answer any *two* of the following :

2×7=14

- (a) Define the terms 'fluid' and 'flow'. Explain the classification of the fluid flow on the basis of the fluid properties and the flow phenomena.
- (b) If the velocity distribution over a plate is given by

$$u = \frac{3}{4}y - y^2,$$

where u is the velocity in m/s at distance y metres above the plate, determine the shear stress at a distance of 0.15 m from the plate. Take the dynamic viscosity of the fluid as 0.834 Ns/m^2 .

- (c) What percentage of an iceberg floats visibly above the sea level, if the density of the iceberg is 900 kg/m^3 and the density of sea water is 1020 kg/m^3 ?

3. Answer any *two* of the following : 2×7=14

- (a) Describe Reynolds experiment on flow through pipes.
- (b) An open tank contains water up to a depth of 1.5 m and above it an oil of specific gravity 0.8 for a depth of 2 m.

Find the pressure

- (i) at the interface of the two liquids, and
 - (ii) at the bottom of the tank.
- (c) The diameters of a small piston and a large piston of a hydraulic jack are 2 cm and 10 cm, respectively. A force of 60 N is applied on the small piston. Find the load lifted by the large piston, when
- (i) the pistons are at the same level, and
 - (ii) the small piston is 20 cm above the large piston.

The density of the liquid in the jack is given as 1000 kg/m^3 .

4. Answer any *two* of the following : 2×7=14

- (a) Define the following coefficients :
 - (i) Coefficient of velocity
 - (ii) Coefficient of contraction
 - (iii) Coefficient of discharge

- (b) A 25 mm diameter nozzle discharges 0.76 m^3 of water per minute when the head is 60 m. The diameter of the jet is 22.5 mm.

Determine :

the values of coefficients C_c , C_v and C_d .

- (c) Find the loss of head when a pipe of diameter 200 mm is suddenly enlarged to a diameter of 400 mm. The rate of flow of water through the pipe is 250 litres/sec.

5. Write short notes on any *four* of the following :

$$4 \times 3 \frac{1}{2} = 14$$

- (a) Bulk Modulus
 - (b) Laminar Flow
 - (c) Unsteady Flow
 - (d) Cavitation
 - (e) Hydraulic Gradient Line
 - (f) Water Hammer
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