

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

00592

**Term-End Examination
December, 2016**

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.

7×2=14

(a) Power transmitted through pipes will be maximum when

(i) head loss due to friction = $\frac{1}{2}$ total head at the inlet of the pipe.

(ii) head loss due to friction = $\frac{1}{4}$ total head at the inlet of the pipe.

(iii) head loss due to friction = total head at the inlet of the pipe.

(iv) head loss due to friction = $\frac{1}{3}$ total head at the inlet of the pipe.

(b) The coefficient of discharge (C_d) in terms of C_v and C_c is

(i) $C_d = \frac{C_v}{C_c}$

(ii) $C_d = \frac{C_c}{C_v}$

(iii) $C_d = C_v \times C_c$

(iv) None of the above

(c) Dynamic viscosity (μ) has the dimension as

(i) $[MLT^{-2}]$

(ii) $[ML^{-1}T^{-1}]$

(iii) $[ML^{-1}T^{-2}]$

(iv) $[M^{-1}L^{-1}T^{-1}]$

(d) Newton's law of viscosity states that

(i) shear stress is directly proportional to the velocity

(ii) shear stress is directly proportional to the velocity gradient

(iii) shear stress is directly proportional to shear strain

(iv) shear stress is directly proportional to the viscosity

- (e) A streamline is a line
- (i) drawn normal to the velocity vector at every point
 - (ii) such that the streamline divides the passage into equal number of parts
 - (iii) which is along the path of a particle
 - (iv) tangent to which is in the direction of the velocity vector at every point
- (f) Capillarity rise and depression phenomena
- (i) depend upon the size of the tube
 - (ii) depend solely upon the surface tension of the liquid
 - (iii) depend upon the surface tension of the liquid as well as the material of the tube
 - (iv) depend upon the pressure difference between the liquid and the environment
- (g) Bernoulli's theorem deals with the law of conservation of
- (i) mass
 - (ii) momentum
 - (iii) energy
 - (iv) None of the above

2. Answer any *two* of the following :

2×7=14

(a) Enumerate Newton's law of viscosity. Explain the importance of viscosity in fluid motion. What is the effect of temperature on viscosity of water and that of air ?

(b) If the velocity distribution over a plate is given by

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

in which u is the velocity in m/sec at a distance y metres above the plate, determine the shear stress at $y = 0$, and $y = 0.15$ m. Take dynamic viscosity of the fluid as 8.63 poise.

(c) What is the bulk modulus of elasticity of a liquid which is compressed in a cylinder from a volume of 0.0125 m^3 at 80 N/cm^2 pressure to a volume of 0.0124 m^3 at 150 N/m^2 pressure ?

3. Answer any *two* of the following :

2×7=14

(a) Differentiate between the following :

- (i) Dynamic viscosity and Kinematic viscosity
- (ii) Absolute and Gauge pressure
- (iii) Simple and Differential manometers
- (iv) Centre of gravity and Centre of buoyancy

(b) An open tank contains water up to a depth of 2 m and above it an oil of specific gravity 0.9 for a depth of 1 m. Find the pressure intensity

- (i) at the interface of the two liquids, and
- (ii) at the bottom of the tank.

(c) A wooden block of width 2 m, depth 1.5 m and length 4 m floats horizontally in water. Find the volume of water displaced and the position of centre of buoyancy. The specific gravity of the wooden block is 0.7.

4. Answer any *two* of the following :

2×7=14

(a) State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's equation from the first principle.

- (b) A pipe, through which water is flowing, is having diameters 20 cm and 10 cm at the cross-sections 1 and 2 respectively. The velocity of water at section 1 is given as 4.0 m/s. Find the velocity head at sections 1 and 2 and also find the rate of discharge.
- (c) A pipe (1), 450 mm in diameter, branches into two pipes (2) and (3) of diameters 300 mm and 200 mm respectively as shown in Figure 1.

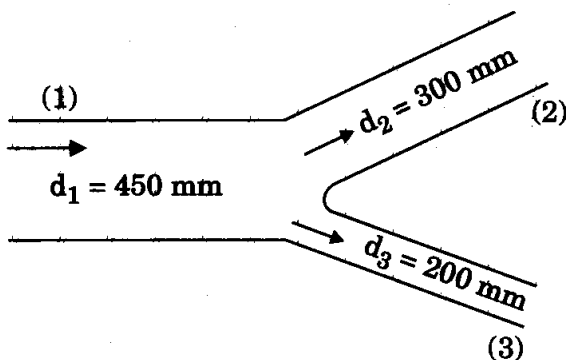


Figure 1

If the average velocity in the 450 mm diameter pipe is 3 m/s, find

- the discharge through the 450 mm diameter pipe, and
- the velocity in the 200 mm diameter pipe, if the average velocity in the 300 mm diameter pipe is 2.5 m/s.

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

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

- (a) Turbulent Flow
 - (b) Steady Flow
 - (c) Compressible Flow
 - (d) Syphons
 - (e) Loss of Head at Bends
 - (f) Orifice Meter
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