

**Diploma in Civil Engineering / Diploma
in Electrical & Mechanical Engineering**

Term-End Examination

June, 2011

02402

BET-037 : FLUID MECHANICS

Time : 2 hours

Maximum Marks : 70

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

1. Choose the correct answer from the given alternatives. **14x1=14**
- (a) A fluid is a substance that :
- (i) always expands until it fills any container.
 - (ii) is practically incompressible.
 - (iii) cannot remain at rest under action of any shear force.
 - (iv) cannot be subjected to shear forces.
- (b) Falling drops of rain acquire spherical shape on account of :
- (i) viscosity
 - (ii) surface tension
 - (iii) vapour pressure
 - (iv) compressibility

- (c) Capillarity is due to :
- (i) adhesion
 - (ii) cohesion
 - (iii) adhesion and cohesion both
 - (iv) neither adhesion nor cohesion.
- (d) Select the correct statement :
- (i) Absolute pressure = Gauge pressure – atmospheric pressure
 - (ii) Gauge pressure = Absolute pressure – atmospheric pressure
 - (iii) Absolute pressure = Atmospheric pressure + Vacuum pressure
 - (iv) Gauge pressure = Atmospheric pressure + Vacuum pressure
- (e) A stream line is :
- (i) the line connecting the mid-points of flow cross section.
 - (ii) defined for uniform flow only.
 - (iii) drawn normal to the velocity vector at every point.
 - (iv) fixed in space in steady flow.
- (f) Stream lines, streak lines and path lines are all identical in case of :
- (i) uniform flow
 - (ii) steady flow
 - (iii) unsteady flow
 - (iv) non-uniform flow

(g) The ratio of actual discharge to theoretical discharge through an orifice is :

- (i) $C_c C_v$ (ii) $C_c C_d$
(iii) $C_v C_d$ (iv) C_d/C_v

(h) Coefficient of resistance C_r for an orifice is equal to :

(i) $(1 - C_v^2)$ (ii) $\left(\frac{1}{C_v^2} - 1 \right)$

(iii) $\left(\frac{1}{C_v^2 C_d^2} - 1 \right)$ (iv) $\left(1 - \frac{C_d^2}{C_v^2} \right)$

(i) Reynold's number may be defined as the ratio of :

- (i) viscous forces to inertia forces
(ii) elastic forces to pressure forces
(iii) inertia forces to viscous forces
(iv) gravity forces to inertia forces

(j) Cavitation is caused by :

- (i) high velocity
(ii) low barometric pressure
(iii) low pressure
(iv) high pressure

(k) The loss of head due to sudden enlargement in a pipe is expressed by :

$$(i) \frac{V_1^2 - V_2^2}{2g} \quad (ii) \frac{V_1^2 - V_2^2}{g}$$

$$(iii) \frac{(V_1 - V_2)^2}{2g} \quad (iv) \frac{(V_1 - V_2)^2}{g}$$

(l) For a plane lamina immersed in a fluid the centre of pressure is always :

- (i) located at the centroid of the lamina
- (ii) located above the centroid of the lamina.
- (iii) independent of the centroid of the lamina.
- (iv) located at the centroid of the pressure prism.

(m) Two pipe systems are said to be equivalent in their lengths when :

- (i) the friction factor and discharge are same in both the systems.
- (ii) the same head loss is produced by the same discharge in both the systems.
- (iii) both the systems are in series.
- (iv) the discharge and diameter are same in both the systems.

- (n) A perfect gas :
- (i) has zero viscosity.
 - (ii) has constant viscosity.
 - (iii) is incompressible.
 - (iv) satisfies $p = \rho RT$.

2. Answer *any two* of the following : **2x7=14**

- (a) State and derive Bernoulli's theorem, mentioning clearly the assumptions underlying it.
- (b) A liquid compressed in a cylinder has a volume of 0.0113 m^3 at $6.87 \times 10^6 \text{ N/m}^2$ pressure and a volume of 0.0112 m^3 at $13.73 \times 10^6 \text{ N/m}^2$ pressure. What is its bulk modulus of elasticity ?
- (c) If a certain liquid has a viscosity of 0.048 poise and kinematic viscosity 3.50×10^{-2} stokes, what is its specific gravity ?

3. Answer *any two* of the following : **2x7=14**

- (a) What is a mouthpiece ? What is the advantage of providing a mouthpiece ?
- (b) If 5 m^3 of a certain oil weighs 40 kN, calculate the specific weight, mass density and specific gravity of the oil.
- (c) A rectangular channel 6 m wide and 1.50 m depth has a bed slope of 1 in 900. Determine the discharge. Assume Manning's $N = 0.015$

4. Answer *any two* of the following : **2x7=14**

- (a) Distinguish between laminar flow and turbulent flow in pipes.
- (b) Two reservoirs are connected by 2 pipes of the same length laid in parallel. The diameters of the pipe are 15 cm and 35 cm respectively. If the discharge through 15 cm diameter pipe is 0.015 cumecs, what will be the discharge through 35-cm pipe ? Assume that f is the same for both pipes.
- (c) A pipe of 25 cm diameter carries water with a mean velocity of 4 m/s. Calculate the discharge.

5. Answer *any two* of the following : **2x7=14**

- (a) What is siphon ? Where is it used ? Explain its working.
 - (b) Obtain the condition for maximum efficiency in transmission of power through a pipeline.
 - (c) What do you understand by :
 - (i) steady and unsteady flow, and
 - (ii) uniform and non-uniform flow.
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