

**DIPLOMA IN CIVIL ENGINEERING (DCLE(G)) /
DIPLOMA IN ELECTRICAL AND MECHANICAL
ENGINEERING (DEME)**

Term-End Examination

June, 2014

00169

BET-037 : FLUID MECHANICS

Time : 2 hours

Maximum Marks : 70

Note : *Answers five questions in all including Question no. 1 which is **compulsory**. All questions carry equal marks. Use of calculator is permitted.*

1. Select the correct answer from the given four alternatives as given below : $7 \times 2 = 14$
- (a) Newton's law of viscosity states that
- (i) Shear stress is directly proportional to the velocity
 - (ii) Shear stress is directly proportional to velocity gradient
 - (iii) Shear stress is directly proportional to shear strain
 - (iv) Shear stress is directly proportional to the viscosity

- (b) The ratio of specific weight of liquid to specific weight of standard fluid is known as
- (i) Specific volume
 - (ii) Weight density
 - (iii) Specific gravity
 - (iv) Viscosity
- (c) Relation between C_d , C_c and C_v is
- (i) $C_d = \frac{C_c}{C_v}$
 - (ii) $C_d = \frac{C_v}{C_c}$
 - (iii) $C_d = C_c C_v$
 - (iv) $C_d = (C_c C_v)^{1/2}$
- (d) The maximum efficiency of power transmission through pipe is
- (i) 50%
 - (ii) 66.67%
 - (iii) 75%
 - (iv) 100%
- (e) Discharge (Q) over a triangular notch is given by
- (i) $\frac{2}{3} C_d \sqrt{2g} \tan \frac{\theta}{2} H^{3/2}$
 - (ii) $C_d \sqrt{2g} \tan \frac{\theta}{2} H^{5/2}$
 - (iii) $\frac{1}{2} C_d \sqrt{2g} \tan \theta H^{5/2}$
 - (iv) $\frac{8}{15} C_d \sqrt{2g} \tan \frac{\theta}{2} H^{5/2}$

(f) The total energy represented by Bernoulli's equation $\left(\frac{p}{w} + \frac{v^2}{2g} + z \right)$ has the units

- (i) Nm/s
- (ii) Ns/m
- (iii) Nm/m
- (iv) m

(g) For the maximum discharge through a circular channel, the depth of flow should be equal to

- (i) 0.6 times the diameter of the channel
- (ii) 0.8 times the diameter of the channel
- (iii) 0.9 times the diameter of the channel
- (iv) 1.2 times the diameter of the channel

2. (a) Define terms : (i) Total pressure (ii) Centre of pressure with respect to an immersed surface in a liquid. 7

(b) An isosceles triangular plate of base 3 m and altitude 3 m is immersed vertically in an oil of specific gravity 0.8 with its base coinciding with free surface of oil. Determine the total pressure and depth of centre of the plate. 7

3. (a) Define Coefficient of contraction (C_c), Coefficient of velocity (C_v) and Coefficient of discharge (C_d) with respect to an orifice. 7
- (b) Liquid of specific gravity 0.85 flows through a 20 cm diameter pipe under a pressure of 100.06 kN/m^2 . If the datum is 3.5 m below the centre of the pipe and the total energy with respect to datum is 24 Nm/N , calculate the discharge through the pipe. 7
4. (a) What do you understand by the term "Mouthpiece"? Sketch and write formulae for discharge and pressure developed for various types of mouthpieces. 7
- (b) A pipeline 22.5 cm diameter and 1580 m long has a slope of 1 in 200 for the first 790 m and an up slope of 1 in 100 for the next 790 m. If the pressure at the uppermost end is 107.91 kN/m^2 and at the lower end is 53.96 kN/m^2 , determine the discharge. Take Darcy's Constant (f) = 0.04. 7
5. (a) Derive the condition for maximum discharge through a trapezoidal channel. 7
- (b) A rectangular channel of 6.0 m width and 1.50 m depth has a bed slope of 1 in 900. Determine the discharge. Use Manning's $N = 0.015$. 7

6. (a) A rectangular notch 2.5 m wide has a constant head of 40 cm. Find the discharge over the notch in litres/second, if coefficient of discharge for the notch is 0.62. 7

(b) A trapezoidal notch 120 cm wide at top and 45 cm at bottom is 30 cm high. Find the discharge through the notch if the head of water is 22.5 cm. Take the coefficient of discharge as 0.6. 7

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

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

- (i) Orifice meter
- (ii) Energy gradient line
- (iii) Submerged orifice
- (iv) Syphons
- (v) Circular channel
- (vi) Venturimeter