

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

Term-End Examination

December, 2018

00613

BET-037 : FLUID MECHANICS

Time : 2 hours

Maximum Marks : 70

Note : Answer all questions. All questions carry equal marks. Use of scientific calculator is permitted.

1. Choose the correct answer from the given alternatives : $14 \times 1 = 14$
- (a) Poise is the unit of
- (i) mass density
 - (ii) kinematic viscosity
 - (iii) dynamic viscosity
 - (iv) velocity gradient
- (b) Continuity equation deals with the law of conservation of
- (i) mass
 - (ii) momentum
 - (iii) energy
 - (iv) None of the above

(c) The coefficient of velocity for an orifice is

(i) $C_v = \sqrt{\frac{X^2}{YH}}$

(ii) $C_v = \frac{2X}{\sqrt{4YH}}$

(iii) $C_v = \sqrt{\frac{X^2}{4YH}}$

(iv) None of the above

(d) Total energy line represents the sum of

(i) pressure head and kinetic head

(ii) kinetic head and datum head

(iii) pressure head and datum head

(iv) pressure head, kinetic head and datum head

(e) When the pipes are connected in series, the total rate of flow is

(i) equal to the sum of the rate of flow in each pipe

(ii) equal to the reciprocal of the sum of the rate of flow in each pipe

(iii) the same as flowing through each pipe

(iv) None of the above

(f) The capillary rise or fall of a liquid is given by

(i)
$$h = \frac{\sigma \cos \theta}{4\rho g d}$$

(ii)
$$h = \frac{4\sigma \cos \theta}{\rho g d}$$

(iii)
$$h = \frac{8\sigma \cos \theta}{\rho g d}$$

(iv) None of the above

(g) The inlet length of a venturimeter is

(i) equal to the outlet length

(ii) more than the outlet length

(iii) less than the outlet length

(iv) None of the above

(h) An oil of specific gravity 0.7 and pressure 0.14 kgf/cm² will have the height of oil as

(i) 70 cm of oil

(ii) 2 m of oil

(iii) 20 cm of oil

(iv) 80 cm of oil

- (i) The rate of flow through a venturimeter varies as
- (i) H
 - (ii) \sqrt{H}
 - (iii) $H^{3/2}$
 - (iv) $H^{5/2}$
- (j) Mouthpieces are used to measure
- (i) velocity
 - (ii) pressure
 - (iii) viscosity
 - (iv) rate of flow
- (k) The discharge through a trapezoidal channel is maximum when
- (i) half of the top width = sloping side
 - (ii) top width = half of the sloping side
 - (iii) top width = $1.5 \times$ sloping side
 - (iv) None of the above
- (l) The depth of flow at which specific energy is minimum is called
- (i) normal depth
 - (ii) critical depth
 - (iii) alternate depth
 - (iv) None of the above

(m) For a circular channel, the wetted perimeter is

(i) $R \theta / 2$

(ii) $3 R \theta$

(iii) $2 R \theta$

(iv) $R \theta$

where, R = Radius

θ = half the angle subtended at the centre

(n) Study of fluid at rest is known as

(i) Kinematics

(ii) Dynamics

(iii) Statics

(iv) None of the above

2. Answer any *two* of the following :

$2 \times 7 = 14$

(a) Define the terms :

density, specific volume, specific gravity, vacuum pressure, compressible and incompressible fluids, viscosity.

(b) Calculate the specific weight, density and specific gravity of one litre of a liquid which weighs 7 N.

(c) The pressure intensity at a point in a fluid is given by 3.924 N/cm^2 . Find the corresponding height of fluid when the fluid is

(i) water, and

(ii) oil of specific gravity of 0.9.

3. Answer any *two* of the following :

2×7=14

- (a) Define the equation of continuity. Obtain an expression for continuity equation for a three-dimensional flow.
- (b) State Bernoulli's theorem. Mention the assumptions made. How is it modified while applying in practice ?
- (c) A pipeline carrying oil of specific gravity of 0.87, changes in diameter from 200 mm dia at a position A to 500 mm dia at a position B, which is 4 metres at a higher level. If the pressures at A and B are 9.81 N/cm^2 and 5.886 N/cm^2 respectively and the discharge is 200 litres/s, determine the loss of head and direction of flow.

4. Answer any *two* of the following :

2×7=14

- (a) The head of water over an orifice of diameter 100 mm is 10 m. The water coming out from orifice is collected in a circular tank of diameter 1.5 m. The rise of water level in this tank is 1.0 m in 25 seconds. Also the coordinates of a point on the jet, measured from vena contracta are 4.3 m horizontal and 0.5 m vertical. Find the coefficients, C_d , C_v and C_c .

- (b) A circular tank of diameter 4 m contains water up to a height of 5 m. The tank is provided with an orifice of dia 0.5 m at the bottom. Find the time taken by water
- to fall from 5 m to 2 m, and
 - for completely emptying the tank.
- Take $C_d = 0.6$.

- (c) Distinguish between the following :
- External mouthpiece and Internal mouthpiece
 - Mouthpiece running free and Mouthpiece running full

5. Answer any *two* of the following : $2 \times 7 = 14$

- (a) What do you understand by total energy line, hydraulic gradient line, pipes in series, pipes in parallel and equivalent pipe ?
- (b) The rate of flow of water through a horizontal pipe is $0.25 \text{ m}^3/\text{s}$. The dia of the pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is 11.772 N/cm^2 .

Determine :

- Loss of head due to sudden enlargement
 - Pressure intensity in the large pipe
- (c) Derive the condition for the best side slope of the most economical trapezoidal channel.