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BET-037

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

Term-End Examination

June, 2018

00103

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 : *14×1=14*

(a) An ideal fluid is defined as the fluid which

(i) is compressible

(ii) is incompressible

(iii) is incompressible and non-viscous

(iv) has negligible surface tension

(b) Kinematic viscosity is defined as equal to

(i) dynamic viscosity × density

(ii) dynamic viscosity/density

(iii) dynamic viscosity × pressure

(iv) pressure × density

(c) Dynamic viscosity has the dimensions as

(i) MLT^{-2}

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

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

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

(d) Stoke is the unit of

(i) surface tension

(ii) dynamic viscosity

(iii) kinematic viscosity

(iv) None of the above

(e) Surface tension has the units of

(i) force per unit area

(ii) force per unit length

(iii) force per unit volume

(iv) None of the above

(f) Atmospheric pressure head in terms of water column is

(i) 7·5 m

(ii) 8·5 m

(iii) 9·81 m

(iv) 10·3 m

(g) Bernoulli's theorem deals with the law of conservation of

(i) mass

(ii) momentum

(iii) energy

(iv) None of the above

(h) The range for coefficient of discharge for a venturimeter is

(i) 0·6 to 0·7

(ii) 0·7 to 0·8

(iii) 0·8 to 0·9

(iv) 0·95 to 0·99

(i) Hydraulic gradient line represents the sum of

(i) pressure head and kinetic head

(ii) kinetic head and datum head

(iii) pressure head, kinetic head and datum head

(iv) pressure head and datum head

(j) The loss of head due to sudden expansion of a pipe is given by

(i) $h_L = \frac{v_1^2 - v_2^2}{2g}$

(ii) $h_L = \frac{0{\cdot}5\, v_1^2}{2g}$

(iii) $h_L = \frac{(v_1 - v_1)^2}{2g}$

(iv) None of the above

(k) The critical depth in a rectangular channel is given by

(i) $\left(\frac{q^2}{g}\right)^{1/2}$

(ii) $\left(\frac{q^2}{g}\right)^{1/3}$

(iii) $\left(\frac{q^2}{g}\right)^{2/3}$

(iv) $\left(\frac{q}{g}\right)^{1/3}$

(l) The hydraulic depth is given by

(i) $\frac{P}{A}$

(ii) $\frac{P^2}{A}$

(iii) $\frac{A}{P}$

(iv) $\sqrt{\frac{A}{P}}$

where, P = Wetted perimeter

A = Area of flow

(m) Orifices are used to measure

(i) Velocity

(ii) Pressure

(iii) Viscosity

(iv) Rate of flow

(n) The term $\frac{v^2}{2g}$ is known as

(i) kinetic energy

(ii) pressure energy

(iii) kinetic energy per unit weight

(iv) None of the above

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

(a) Define the following fluid properties :

Density, weight density, specific volume and specific gravity of a fluid.

(b) Explain the following :

Newtonian and Non-Newtonion fluids and Vapour Pressure

(c) Calculate the density, specific weight and weight of one litre of petrol of specific gravity = 0·7.

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

(a) A 25 cm dia pipe carries oil of sp.gr. 0·9 at a velocity of 3 m/s. At another section the dia is 20 cm. Find the velocity at this section and also mass rate of flow of oil.

(b) Derive Bernoulli's equation for steady flow of an incompressible fluid.

(c) A pipe through which water is flowing, is having diameter 600 mm at the upper end and 300 mm at the lower end, respectively. The length of pipe is 100 m and rate of flow of water is 50 litre/s. The pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher level is 19·62 N/cm^2.

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

(a) A tank has two identical orifices in one of its vertical sides. The upper orifice is 3 m below the water surface and lower one is 5 m below the water surface. If the value of C_v for each orifice is 0·96, find the point of intersection of the two jets.

(b) Obtain an expression for absolute pressure head at vena-contracta for an external mouthpiece.

(c) An orifice of diameter 150 mm is filled at the bottom of a boiler drum of length 8 m and of diameter 3 m. The drum is horizontal and contains water up to a height of 2·4 m. Find the time required to empty the boiler. Take C_d = 0·6.

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

(a) Calculate the discharge through a pipe of diameter 200 mm when the difference of pressure head between the two ends of a pipe 500 m apart is 4 m of water. Take the value of f = 0·009 in the formula $h_f = \frac{4f\,l\,v^2}{2gd}$.

(b) 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/second.

(c) Find the discharge through a rectangular channel of width 2 m, having a bed slope of 4 in 8000. The depth of flow is 1·5 m and take the value of N in Manning's formula as 0·012.