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

Term-End Examination

01480

December, 2012

BET-037 : FLUID MECHANICS

Time : 2 hours *Maximum Marks : 70*

Note : *All questions are* ***compulsory****. Draw neat sketch wherever necessary. Use of scientific calculator is* ***permitted****.*

1. Select the correct alternatives : **2x7=14**

(a) Newton law of viscosity relates :

(i) the shear stress and strain in a fluid

(ii) the shear stress, pressure and velocity

(iii) the shear stress and rate of strain

(iv) none of the above

(b) Capillary rise and depression phenomena :

(i) are observed only in vertical tubes.

(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.

(c) The total energy represented by Bernaulli's equation $\left(\frac{p}{w} + \frac{v^2}{zg} + Z\right)$ has the units :

(i) Nm/s (ii) Ns/m

(iii) Nm/m (iv) Nm/N

(d) The Rynold's number is defined as the ratio of :

(i) gravity force to viscous force

(ii) viscous force to inertia force

(iii) inertia force to viscous force

(iv) gravity force to inertia force

(e) A tube tapers from 0.2 m to 0.02 m diameter. If the velocity at the first cross-section is 0.5 ms^{-1}, then velocity at the second cross-section is :

(i) 50.0 ms^{-1} (ii) 5.0 ms^{-1}

(iii) 1.0 ms^{-1} (iv) 0.5 ms^{-1}

(f) The Total Energy Line (TEL) 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.

(g) The maximum velocity through a circular channel takes place when depth of flow is equal to :

(i) 0.95 times the diameter

(ii) 0.50 time the diameter

(iii) 0.81 times the diameter

(iv) 0.61 times the diameter

2. Answer *any two* of the following : **7x2=14**

(a) The specific volume of a certain gas is 0.70 m^3/kg. Determine its specific weight and mass density.

(b) Estimate the height to which water column at 20°C will rise in a capillary tube 3 mm diameter. Take $\sigma = 0.0735$ N/m.

(c) A rectangular tank 5 m long and 2 m wide contains water upto a depth of 2.5 m. Calculate the pressure on base and vertical sides of the tank.

3. Answer *any two* of the following : **7x2=14**

(a) An inclined pipe carrying water gradually changes in diameter from 15 cms at A to 40 cm at B at a height of 4.5 m above A. If the pressure at A and B are respectively 68.67 kN/m^2 and 49.05 kN/m^2 and the discharge is 0.150 m^3/s, determine :

(i) the direction of flow, and

(ii) the head loss between A and B

(b) A venturimeter having a throat diameter of 100 mm is fitted in a pipe of diameter 250 mm through which oil of specific gravity 0.85 is flowing. The pressure difference between the entry is measured by a U-tube manometer containing mercury (Sp gr = 13.6) and the deflection of the manometer is 0.60 m. Calculate the discharge. Assume Coefficient (C) = 0.97.

(c) Water flows through a 200 mm diameter pipe fitted with a 100 mm diameter horizontal orifice meter at the rate of 0.015 m^3/s. Determine the difference of pressure head between the upstream and the veena contracta. Take C = 0.61.

4. Answer *any two* of the following : **7x2=14**

(a) A pipe carrying water suddenly enlarges from a diameter 40 cm to 60 cm. If the discharge is 0.615 cumecs. Calculate the loss of head due to sudden enlargement.

(b) A rectangular channel has a base width of 2.5 m and a slope of 1 is 400. Find the depth of flow, if the discharge is 10 m^3. Use Chezy's formula. Take C = 50.

(c) A 60 mm diameter orifice is discharging water under a head of 9 meters. Calculate the actual discharge in litres per second and actual velocity of jet is meters per second at veena contracta, if Cd = 0.6 and Cv = 0.9.

5. Write short notes on ***any four*** of the following : $3\frac{1}{2}x4=14$

(a) Bernaullis' equation and its limitations.

(b) Submerged Orifice

(c) Rynold's experiment on flow through pipes.

(d) Energy Gradient Line (EGL)

(e) Orifice meter

(f) External mouthpiece