DIPLOMA IN CIVIL ENGINEERING / DIPLOMA IN ELECTRICAL & MECHANICAL ENGINEERING

Term-End Examination 03620

June, 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 : **7x2=14**

(a) If A is the area of a horizontal immersed surface, ω is the specific weight of the liquid and x^- is the depth of horizontal surface from the liquid surface, then total Pressure P on the surface is given by :

(i) $P = \omega A^2 x^-$

(ii) $P = \omega^2 A x^-$

(iii) $P = \omega A x^-$

(iv) $P = \omega A x^{-2}$

(b) Centre of Pressure ($\bar{h}$) in case of an inclined surface immersed in water, is given by :

(i) $\bar{h} = \frac{I_G \sin\theta}{A\bar{x}} + x^-$

(ii) $\bar{h} = \frac{I_G \sin\theta}{A^2\bar{x}} + x^-$

(iii) $h^- = \frac{I_{G^2} \sin\theta}{A\bar{x}} + x^-$

(iv) $h^- = \frac{I_G \sin^2\theta}{A\bar{x}} + x^-$

(c) A Newtonian fluid is that :

(i) Which follows laws of motion

(ii) Which needs a minimum shear force before it starts deforming

(iii) For which shear and deformation are related as $\tau = \mu\frac{du}{dy}$, where μ is a constant.

(iv) None of the above.

(d) For three pipes connected in parallel and having discharges Q_1, Q_2, Q_3 respectively, and total discharge Q, which condition is correct ?

(i) $Q_1 = Q_2 = Q_3 = Q$

(ii) $Q = Q_1 + Q_2 + Q_3$

(iii) $Q = \frac{Q_1 + Q_2 + Q_3}{3}$

(iv) $Q = [Q_1 \times Q_2 \times Q_3]^{1/3}$

(e) If the slope of free liquid surface in a channel flow is 'S_W' and slope of HGL is 'S_H', then which statement is correct ?

(i) $S_W = S_H$

(ii) $S_W > S_H$

(iii) $S_W < S_H$

(iv) $S_W \geq S_H$

(f) 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) $C_d = (C_c C_v)^{1/2}$

(g) Discharge (Q) over a triangular notch is given by :

(i) $\frac{2}{3} C_d \sqrt{2g} \tan \frac{\theta}{2} H^{\frac{3}{2}}$

(ii) $C_d \sqrt{2g} \tan \frac{\theta}{2} H^{\frac{5}{2}}$

(iii) $\frac{1}{2} C_d \sqrt{2g} \tan \theta H^{\frac{5}{2}}$

(iv) $\frac{8}{15} C_d \sqrt{2g} \tan \frac{\theta}{2} H^{\frac{5}{2}}$

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

(a) Find the height through which water rises by capillary action in a glass tube of 2 mm bore, if the surface tension at the prevailling temperature is 0.075 N/m.

(b) State and Prove Bernaulli's equation. Write assumptions which are made while driving Bernaulli's equation ?

(c) A tank contains water of density 9.81 KN/m^3 upto a height of 4 m above base. An immiscible liquid of specific gravity 0.85 is filled on the top of that over 3 m depth. Calculate the pressure at a point 2.5 m below the free surface, at the interface and at another point 4 m below the free surface.

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

(a) A sharp edged Orifice of 6 cms diameter discharges water under a head of 6 m. Find the values of the coefficient of velocity, coefficient of contraction and coefficient of discharge, if the measured rate of flow is 0.016 Cumecs. The diameter of jet at Veena Contracta is 5 cms.

(b) A 160 mm diameter pipe reduces in diameter abruptly to 120 mm diameter. If the pipe carries water 0.04 m^3/sec, calculate the loss of head across the contraction. Take Cc = 0.60.

(c) Find the loss of head due to friction in a pipe carrying water. The pipe is 400 m long and 20 cms in diameter. The discharge through the pipe is 0.05 Cumecs. Take f = 0.04.

4. Answer *any one* of the following : **14**

(a) A pipe consists of three pipes in series as follows :

(i) 300 m long, 15 cms diameter.

(ii) 150 m long, 10 cms diameter.

(iii) 240 m long, 20 cms diameter.

The first pipe takes off from a reservoir with water level at an elevation of 500.00 m. If the elevations of pipe at exit is 400.00 m, find the discharge. Assume f = 0.04. Neglect minor losses.

(b) A pipe 200 mm diameter and 1200 m long connects two reservoirs, one being 30 m lower than the other. The pipe crosses is a ridge whose summit is 2.5 m above the upper reservoir. Determine the depth of the apex below the ridge in order to ensure that the pressure in the pipe does not fall below 7.80 m (vacuum). The length of the pipe from the upper reservoir to the pipe apex is 300 m. Take $f = 0.03$.

5. Do *any one* of the following : **4x3½=14**

(a) The cross-section of an open channel is trapezium with a bottom width of 4 m and side slopes 1 vertical to 2 horizontal. Calculate the discharge, if the depth of water is 1.5 m and $S = \frac{1}{1600}$. Use Chezy's formula. Take $C = 50$.

(b) Write short notes on ***any four*** :

(i) Viscosity

(ii) Syphons

(iii) Hydraulic Coefficients

(iv) Notches and weirs

(v) Steady and unsteady flow

(vi) Most economical section of a rectangular channel.