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BET-037

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

Term-End Examination

December, 2014

01395

BET-037 : FLUID MECHANICS

Time : 2 hours *Maximum Marks : 70*

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

1. Select the correct answer from the four given alternatives : *7×2=14*

(a) Surface tension is caused by which forces at the free surface ?

(i) Cohesive forces

(ii) Adhesive forces

(iii) Both cohesives and adhesive forces

(iv) None of the above

(b) The Reynolds 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

(c) 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

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

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

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

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

(iv) $Q = (Q_1 + Q_2 + Q_3)^{1/3}$

(e) For best trapezoidal section

(i) depth of flow = half the bed width

(ii) side slope is 45°

(iii) the shape is of a half hexagon

(iv) None of the above

(f) The energy loss in a pipeline is due to

(i) Surface roughness only

(ii) Viscous action only

(iii) Friction offered by pipe wall as well as by viscous action

(iv) None of the above

(g) Which of the following may be used for measuring the rate of flow of water in rivers or a stream ?

(i) Notch

(ii) Orifices

(iii) Weir

(iv) None of these

2. (a) If 10 m^3 of mercury weighs 1329 kN, calculate its mass density, specific weight and specific gravity. 7

(b) Estimate the height to which water column at 20°C will rise in a capillary tube 3 mm diameter. Take surface tension $\sigma = 0{\cdot}0735$ N/m. 7

3. (a) Describe the trajectory for determining the coefficient of velocity (C_v) for a vertical orifice experimentally. Also give a neat sketch of the set-up. 7

(b) A sharp edged circular orifice 4 cm diameter projects a jet horizontally under a head of 2 m. If the jet strikes at a point that is 1·36 m horizontally and 0·24 m vertically away from the vena contracta, calculate the coefficient of velocity (C_v).

If the diameter of jet at vena contracta is 3·2 cm, calculate the coefficient of contraction (C_c) and Coefficient of discharge (C_d). 7

4. (a) State and prove Bernoulli's equation. Write the assumptions which are made while deriving Bernoulli's equation. 7

(b) Water flows through a horizontal venturimeter 30 cm × 15 cm diameter at the rate of 0·039 cumec. If the difference of pressure is 0·25 m of water, calculate the coefficient of venturimeter. 7

5. (a) Derive the condition for maximum discharge through a rectangular channel. 7

(b) The cross-section of a channel is a trapezium with 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 $S = \frac{1}{1,600}$. Use Chezy's formula. Chezy's constant C = 50. 7

6. (a) Find an expression for the power transmission through a pipe line. What is the condition for maximum transmission of power, and what is the corresponding efficiency of transmission ? 7

(b) Find the loss of head due to friction in a pipe carrying water, if it is 400 m long and 20 cm diameter. The discharge through the pipe is 0·05 cumecs. Take f = 0·04. 7

7. Write short notes on any ***four*** of the following : $4 \times 3\frac{1}{2} = 14$

(i) Hydraulic coefficients

(ii) Pipes in series and parallel

(iii) Most economical section of a circular channel

(iv) Partially submerged orifice

(v) Mouth pieces

(vi) Energy gradient line