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BET-037

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

00317

Term-End Examination

December, 2017

BET-037 : FLUID MECHANICS

Time : 2 hours *Maximum Marks : 70*

Note : *All questions are* ***compulsory*** *and carry equal marks. Use of scientific calculator is permitted.*

1. Select the correct alternative. *7×2=14*

(a) With increase of temperature, viscosity of liquids and gases

(i) increases for both

(ii) decreases for both

(iii) increases for liquids and decreases for gases

(iv) decreases for liquids and increases for gases

(b) Borda-Carnot equation for loss of head due to sudden enlargement is

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

(ii) $\frac{v_1^2 - v_2^2}{2g}$

(iii) $\frac{\sqrt{v_1^2 - v_2^2}}{2g}$

(iv) $\frac{v_1^2 - v_2^2}{\sqrt{2g}}$

(c) For three pipes connected in series and having discharge Q_1, Q_2 and Q_3 respectively and total discharge Q, which statement is correct ?

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

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

(iii) $Q = \frac{Q1 + Q2 + Q3}{3}$

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

(d) The wetted perimeter of a circular pipe of diameter 'D' which is running full, will be

(i) D/2

(ii) πD

(iii) D/4

(iv) $\pi D^2/4$

(e) A circular sharp-edged orifice is having $C_v = 0{\cdot}9$ and $C_d = 0{\cdot}585$. Its coefficient of contraction C_c will be

(i) 0·5265

(ii) 0·7256

(iii) 0·650

(iv) 0·806

(f) The vertical intercept between the hydraulic gradient line and the energy gradient line in a pipe flow is

(i) $\frac{v}{\sqrt{2g}}$

(ii) $\frac{v^2}{2g}$

(iii) $\frac{hf}{L}$

(iv) $v\sqrt{2g}$

(g) Manning's formula for channel flow is

(i) $n\sqrt{RS} = V$

(ii) $V = n R^{2/3} S^{1/2}$

(iii) $\frac{1}{n} R^{2/3} S^{1/2} = V$

(iv) $V = \frac{1}{n} R^{1/2} S^{2/3}$

2. Answer any ***two*** of the following :

(a) Derive the expression for capillary rise 'h' if surface tension is σ, tube diameter is d. Hence, estimate the height to which the water column at 20°C will rise in a capillary tube of 4 mm diameter. Take σ = 0·0735 N/m. Assume angle of contact θ = zero. *4+3=7*

(b) With the help of a neat line sketch, describe the absolute, gauge, vacuum and atmospheric pressure. *7*

(c) Derive the impulse momentum equation, if the velocity of a body of mass 50 kg changes from 3 m/s to 5 m/s in the same direction in a time of 20 seconds. Determine the applied force and the impulse. *3+4=7*

3. Answer any ***two*** of the following :

(a) Explain the relative merits and demerits of an orifice meter and a venturimeter. *7*

(b) Differentiate between the following : *7*

(i) Steady flow and Unsteady flow

(ii) Ideal fluid and Real fluid

(c) A liquid of specific gravity 0·85 flows through a 20 cm diameter pipe under a pressure of 100·06 kN/m^2. If the datum is 3·5 m below the centre of the pipe and the total energy with respect to datum is 24 N-m/N, calculate the discharge. 7

4. Answer any ***two*** of the following :

(a) A sharp-edged circular orifice of 40 mm diameter projects a jet horizontally under a head of 3 m. If the jet strikes at a point 1·9 m horizontally and 0·32 m vertically from the vena contracta, calculate the coefficient of velocity C_v. Give a neat sketch of the problem. *5+2=7*

(b) Describe the "Trajectory Method" for determining the coefficient of velocity for a vertical orifice, experimentally. Also give a neat sketch, marking the various terms used in the formula. 7

(c) A pipe carrying 0·08 cumecs of water suddenly contracts from 30 cm to 20 cm diameter. Calculate the coefficient of contraction, if the loss of head is 0·4 m. 7

5. Answer any ***two*** of the following :

(a) Calculate the discharge through a trapezoidal channel, having a bottom width of 3 n and side slopes 1 vertical to 1·5 horizontal. The slope of bed is 1/1500 and depth of water is 1·2 m. Use Manning's formula and take n = 0·025. 7

(b) With the help of a neat sketch, explain the working of a siphon. 7

(c) Enlist the minor losses that usually occur in a pipe flow. Explain any one of them in detail (giving a neat schematic sketch). 7