Diploma in Civil Engineering / Diploma · in Electrical & Mechanical Engineering

Term-End Examination
June, 2010

01317

BET-037 : FLUID MECHANICS

Time : 2 hours   *Maximum Marks : 70*

Note :   *All questions are **compulsory**. Use of calculator is permitted.*

1.   Select the correct answer from the given **four** alternatives for the following :   **14x1=14**

(a)   Newton's law of viscosity states that :

(i)·   shear stress is directly proportional to the velocity.

(ii)   Shear stress is directly proportional to velocity gradient.

(iii)   Shear stress is directly proportional to shear strain

(iv)   Shear stress is directly proportional to the viscosity.

(b)   The increase of temperature :

(i)   increases the viscosity of a liquid

(ii)   decreases the viscosity of a liquid

(iii)   decreases the viscosity of a gas

(iv)   none of the above

(c) The co-efficient of discharge (Cd)

    (i)   for an orifice is more than that for a mouth piece

    (ii)   for an internal mouth piece is more than that for external mouth piece

    (iii) for a mouth piece is more than that for an orifice

    (iv) none of the above.

(d) Power transmitted through pipes, will be maximum when :

    (i)   head lost due to friction $= \dfrac{1}{2}$ total head at inlet of the pipe

    (ii)   head lost due to friction $= \dfrac{1}{4}$ total head at inlet of the pipe

    (iii) head lost due to friction $=$ total head at the inlet of the pipe

    (iv) head lost due to friction $= \dfrac{1}{3}$ total head at the inlet of the pipe

(e) Continuity equation can take the form :

    (i) $A_1 V_1 = A_2 V_2$

    (ii) $\rho_1 A_1 = \rho_2 A_2$

    (iii) $\rho_1 A_1 V_1 = \rho_2 A_2 V_2$

    (iv) $P_1 A_1 V_1 = P_2 A_2 V_2$

(f) The term $\dfrac{v^2}{2g}$ is known as :

    (i)   static energy

    (ii)   pressure energy

    (iii)   kinetic energy per unit weight

    (iv)   none of the above

(g) The discharge through a trapezoidal channel is maximum when :

    (i)   half of top width = sloping side

    (ii)   top width = half of sloping side

    (iii)   top width = 1.5 sloping side

    (iv)   none of the above

(h) Dynamic viscosity (μ) has the dimension as :

    (i) $[MLT^{-2}]$ (ii) $[ML^{-1}T^{-1}]$

    (iii) $[ML^{-1}T^{-2}]$ (iv) $M^{-1}L^{-1}T^{-1}$

(i) 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

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

    (i)   mass   (ii)   momentum

    (iii)   energy   (iv)   none of the above

(k) Pitot tube is used for the measurement of :

(i) pressure

(ii) flow

(iii) velocity at a point

(iv) discharge

(l) Manometer is a device used for measuring :

(i) velocity at a point in a fluid

(ii) pressure at a point in a fluid

(iii) discharge of a fluid

(iv) none of the above

(m) The ratio of actual velocity of a jet of water at veena-contracta to the theoretical velocity is known as :

(i) co-efficient of discharge

(ii) co-efficient of velocity

(iii) co-efficient of contraction

(iv) co-efficient of viscosity

(n) The ratio of inertia force to viscous force is known as :

(i) Reynolds number

(ii) Froude number

(iii) Mach number

(iv) Euler number

2. Answer *any two* of the following : 2x7=14

(a) Define pressure. Obtain an expression for the pressure intensity at a point in a fluid.

(b) A pipe through which water is flowing is having diameters 20 cm and 10 cm at the cross-sections 1 and 2, respectively. The velocity of water at section 1 ia given as 4.0 m/s. Find the velocity head at sections 1 and 2 and also the rate of discharge.

(c) Explain the term :

(i) Path line

(ii) Streak line

(iii) Stream line and

(iv) Stream tube

3. Answer *any two* of the following : 2x7=14

(a) (i) Define co-efficient of contraction and co-efficient of discharge.

(ii) Derive the expression $C_d = C_v \times C_c$

(b) water flows through a 250 mm diameter pipe fitted with a 125 mm diameter horizontal orifice meter at the rate of 0.020 m³/s. Determine the difference of pressure head between the upstream and the vena-contracta. Take co-efficient C = 0.65.

(c)   A pipe consists of 3 pipes in series as follows :

(i)   400 m long 20 cm diameter

(ii)   200 m long 15 cm diameter

(iii)   300 m long 25 cm diameter

The first pipe takes off from a reservoir with water level at an elevation of 600 m. If the elevation of the pipe at the exit is 500 m, find the discharge. Assume $f = 0.04$. Neglect minor losses.

4.   Answer *any two* of the following :   2x7=14

(a)   What do you mean by "equivalent pipe", and "flow through parallel pipes" ?

(b)   A sharp-edged orifice of 4.2 cm diameter discharges water under a head of 3.2 m. Determine the discharge if the co-efficients $C_v = 0.97$, and $C_c = 0.64$.

(c)   A 180 mm diameter pipe reduces in diameter abruptly to 120 mm diameter. If the pipe carries water at 0.04 m^3/s, calculate the loss of head across the contraction. Take the co-efficient of contraction as 0.62.

5.   Write short notes on *any four* of the following :

(a)   Viscosity   4x3½=14

(b)   Surface Tension

(c)   Venturimeter

(d)   External mouth piece

(e)   Reynold's experiment

(f)   Hydraulic Gradient line

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