Diploma in Civil Engineering / Diploma in Electrical & Mechanical Engineering

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Term-End Examination

December, 2010

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

      (i)   A Newtonian fluid is defined as the fluid
             which :

             (a)   is in compressible and non-viscous

             (b)   Obey's Newton's law of viscosity

             (c)   is highly viscous

             (d)   is compressible and non-viscous

      (ii)   A flow is said to be laminar when :

             (a)   The fluid particles move in a Zig-Zag
                    way

             (b)   The Reynold's number is high

             (c)   The fluid particles move in layers
                    parallel to the boundary

             (d)   None of the above

(iii) Hydraulic gradient line (HGL) represents the sum of :

(a) pressure head and kinetic head.

(b) kinetic head and datum head.

(c) pressure head, kinetic head and datum head.

(d) pressure head and datum head.

(iv) When the pipes are connected in series, the total rate of flow :

(a) is equal to the sum of the rate of flow in each pipe.

(b) is equal to the reciprocal of the sum of the rate of flow in each pipe.

(c) is the same as flowing through each pipe.

(d) none of the above.

(v) The centre of pressure for a plane vertical surface lies at a depth of :

(a) half the height of the immersed surface

(b) one - third the height of the immersed surface

(c) two - third the height of the immersed surface

(d) none of the above.

(vi) When the pipes are connected in parallel, the total loss of head :
   (a) is equal to the sum of the loss of head in each pipe.
   (b) is same as in each pipe.
   (c) is equal to the reciprocal of the sum of loss of head in each pipe.
   (d) none of the above.

(vii) Chezy's formula is given as :
   (a) $V = i\sqrt{mc}$
   (b) $V = c\sqrt{mi}$
   (c) $V = m\sqrt{ci}$
   (d) none of the above

(viii) Poise is the unit of :
   (a) mass density
   (b) kinematic viscosity
   (c) viscosity
   (d) velocity gradient

(ix) Guage pressure at a point is equal to :
   (a) absolute pressure plus atmospheric pressure
   (b) absolute pressure minus atmospheric pressure
   (c) Vacuum pressure plus absolute pressure
   (d) none of the above

(x) Reynold's number is defined as the :
   (a) ratio of inertia force to gravity force.
   (b) ratio of viscous force to gravity force.
   (c) ratio of viscous force to elastic force.
   (d) ratio of inertia force to viscous force.

(xi) Continuity equation deals with the law of conservation of :

(a) mass   (b) momentum

(c) energy   (d) none of the above

(xii) The co-efficient of discharge (C_d) in terms of C_v and C_c is :

(a) $C_d = \dfrac{C_v}{C_c}$

(b) $C_d = C_v \times C_c$

(c) $C_d = \dfrac{C_c}{C_v}$

(d)   none of the above

(xiii) Mouthpieces are used to measure :

(a) velocity   (b) pressure

(c) viscosity   (d) rate of flow

(xiv) The ratio of actual discharge of a jet of water to its theoretical discharge is known as :

(a) Co - efficient of discharge.

(b) Co - efficient of velocity.

(c) Co - efficient of contraction.

(d) Co - efficient of viscosity.

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

(a) State Bernoulli's theorem for steady flow of an incompressible flow. Drive an expression for Bernoulli's equation from first principles, and state the assumptions made for such a derivations

(b) Oil flows through a pipe of 50cm diameter at point A to 35 cm diameter at point B. At point B, it bifurcates into two branches consisting of pipes of 25 cm and 15 cm diameter as shown in figure 1. If the velocity at A is 2.5 m/sec, calculate the discharge at A and the velocities at B and C. The velocity at D is 4.2 m/sec.

Figure - 1
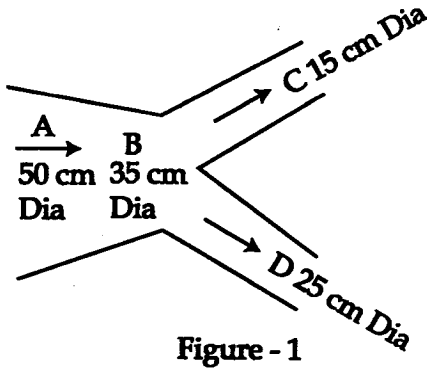
(c) Distinguish between (any two) :

(i) Steady flow and un - steady flow

(ii) Uniform and non - uniform flow

(iii) Laminar and turbulent flow.

3. Answer *any two* of the following :   2x7=14
    (a) The head of water over an orifice of diameter
         50 mm is 12 m. Find the actual discharge
         and actual velocity of jet at vena-contracta
         take C_d= 0.6 and C_v=0.98.
    (b) Water flows in a 200m diameter pipe, fitted
         with a 100mm diameter horizontal orifice
         meter, at the rate of $0.020m^3$/sec. Determine
         the difference of pressure head between the
         upstream and the vena contracta. Take
         Co-efficient C=0.65
    (c) A rectangular channel 6.0m wide and
         1.50m depth has a led slope of 1 in 900.
         Determine the discharge. Take Manning's
         n=0.016

4. Answer *any two* of the following :   2x7=14
    (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 ?
    (b) A pipe line 24 cm diameter and 1680 m long
         has an up slope of 1 in 200 for the first
         840 m, and an up slope of 1 in 100 for the
         next 840 m. If the pressure at the upper end
         of the pipe line is 110 kN/M^2 and that at
         the lower end is 54 kN/M^2 determine the
         discharge. Take Darey's f=0.04

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

5. Write short notes on *any four* of the following :
    (a) Bulk Modulus   4x3½=14
    (b) Orifice meter
    (c) Co - efficient of Resistance
    (d) Internal Mouthpiece
    (e) Hydraulic Radius
    (f) Energy gradient lines.

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