| BICE-028 |

DIPLOMA – VIEP – MECHANICAL ENGINEERING (DCLEVI)

Term-End Examination

December, 2016

00303

BICE-028 : FLUID MECHANICS

Time : 2 hours   *Maximum Marks : 70*

Note : *Attempt any **five** questions. Question no. **1** is **compulsory**. **Four** questions are to be attempted out of the remaining questions. Use of scientific calculator is permitted. Assume missing data, if any.*

1. Write the correct answer for the following :   *7×2=14*

    (a) Bernoulli's equation contains the following :

        (i)   Velocity head

        (ii) Datum head

        (iii) Potential head

        (iv) All of the above

    (b) Specific gravity of a liquid is the ratio of

        (i)   density of liquid to density of water

        (ii) density of water to density of liquid

        (iii) density of liquid

        (iv) density of water to density of air

(c) Absolute Pressure on a liquid is given as

    (i)   Gauge Pressure

    (ii)   Vacuum Pressure

    (iii) Gauge + Vacuum Pressure

    (iv) Mass × Velocity

(d) Flow is termed steady if the fluid characteristics

    (i)   do not change at a point with time

    (ii)   do not change with distance at a given time

    (iii) constantly change with respect to time

    (iv) None of the above

(e) Continuity equation is based on the conservation of

    (i)   Mass

    (ii)   Momentum

    (iii) Energy

    (iv) Velocity

(f) Pitot tube is used for measuring

    (i)   Area

    (ii)   Discharge

    (iii) Velocity

    (iv) Energy

(g) Minor losses occur due to

    (i)   Bends

    (ii)   Pipe fitting

    (iii) Enlargement

    (iv) All of the above

2. (a)   Describe the continuity equation.   *4*

    (b)   A 30 cm diameter pipe, carrying water, branches into two pipes of diameters 20 cm and 15 cm. If the average velocity in the 30 cm diameter pipe is 2·5 m/s, find the discharge in this pipe. Also determine the velocity in the 15 cm pipe, if the average velocity in the 20 cm pipe is 2 m/s.   *10*

3. (a)   State the Bernoulli's theorem and write the assumptions made in its derivation.   *5*

    (b)   Derive Bernoulli's equation from Euler's equation.   *5*

    (c)   Water is flowing through a pipe of 5 cm diameter, under a pressure of 29·43 N/cm^2 (gauge) and with mean velocity of 2 m/s. Find the total head of the water at a cross-section, 5 m above the datum line.   *4*

4. **(a)** What are orifices ? How are they classified based on cross-sectional area and submergence level ? *2+4*

(b) A circular tank of 4 m diameter contains water up to 5 m height. The tank is provided with an orifice of diameter 0·05 m at the bottom. Find the time taken by water

(i) to fall from 5 m to 2 m, and

(ii) for completely emptying the tank.

Assume $C_d = 0·6$. *8*

5. **(a)** Find the head loss when a pipe of diameter 200 mm is suddenly enlarged to a diameter of 400 mm. The rate of water flow through the pipe is 250 *l*/s. *7*

(b) A 150 mm diameter pipe reduces in diameter abruptly to 100 mm diameter. If the pipe carries water at 30 *l*/s, calculate the pressure loss across the contraction. Assume $C_c = 0·6$. *7*

6. (a) Find the flow velocity and flow rate of water through a rectangular channel of width 6 m and 3 m depth, when it is running full. The channel has a bed slope of 1 in 2000. Assume Chezy's constant C = 55.   6

(b) The rate of flow of water through a circular channel of diameter 0·6 m is 150 l/s. Find the slope of the bed of the channel for maximum velocity. Take C = 60.   8

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

(a) Capillarity

(b) Principle of Conservation of Energy

(c) Venturimeter

(d) Vena Contracta

(e) Circular Formula