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BICE-028

DIPLOMA – VIEP – MECHANICAL ENGINEERING (DMEVI)

Term-End Examination

01055

December, 2014

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 questions no. 2 to 7. Use of scientific calculator is permitted.*

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

(a) 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

(b) Continuity equation can take the form

(i) $A_1 V_1^2 = A_2 V_2^2$

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

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

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

(c) The loss of head due to sudden expansion of a pipe is given by

(i) $h_L = \frac{V_1^2 - V_2^2}{2g}$

(ii) $h_L = \frac{0{\cdot}5\ V_1^2}{2g}$

(iii) $h_L = \frac{(V_1 - V_2)^2}{2g}$

(iv) None of the above

(d) Reynolds number is defined as the

(i) ratio of inertia force to gravity force.

(ii) ratio of viscous force to gravity force.

(iii) ratio of viscous force to elastic force.

(iv) ratio of inertia force to viscous force.

(e) The point, through which the buoyant force is acting, is called

(i) centre of pressure

(ii) centre of gravity

(iii) centre of buoyancy

(iv) None of the above

(f) The rate of flow through a venturimeter varies as

(i) H

(ii) $\sqrt{H}$

(iii) $H^{3/2}$

(iv) $H^{5/2}$

(g) When the pipes are connected in parallel, the total loss of head is

(i) equal to the sum of the loss of head in each pipe.

(ii) same as in each pipe.

(iii) equal to the reciprocal of the sum of loss of head in each pipe.

(iv) None of the above

2. (a) Define surface tension and capillarity. Obtain an expression for capillary rise of a liquid. *6*

(b) An open tank contains water upto a depth of 1·5 m and above it an oil of sp. gr. 0·8 for a depth of 2 m. Find the pressure intensity (i) at the interface of the two liquids, and (ii) at the bottom of the tank. *8*

3. (a) Define the equation of continuity. Obtain an expression for the continuity equation. *6*

(b) A pipe of diameter 30 cm carries water at a velocity of 20 m/sec. The pressures at the points A and B are given as 34·335 N/cm^2 and 29·43 N/cm^2 respectively, while the datum head at A and B are 25 m and 28 m. Find the loss of head between A and B. *8*

4. (a) Differentiate between a large and a small orifice. Obtain an expression for discharge through a large rectangular orifice. *7*

(b) A circular tank of diameter 3 m contains water upto a height of 4 m. The tank is provided with an orifice of diameter 0·4 m at the bottom. Find the time taken by water (i) to fall from 4 m to 2 m (ii) for completely emptying the tank. Take $C_d = 0·6$. *7*

5. (a) Obtain an expression for head loss in a sudden expansion in the pipe. 7

(b) A horizontal pipe of diameter 400 mm is suddenly contracted to a diameter of 200 mm. The pressure intensities in the larger and smaller pipe are given as 14·715 N/cm^2 and 12·753 N/cm^2 respectively. If C_c = 0·62, find the loss of head due to contraction. Also determine the rate of flow of water. 7

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

(b) The rate of flow of water through a pipe of length 1,500 m and diameter 800 mm is $2m^3/s$. At the end of the pipe a nozzle of diameter 200 mm is fitted. Find the power transmitted through the nozzle if the head of water at the inlet of the pipe is 180 m and f = 0·01 for pipe. 7

7. (a) Derive an expression for the discharge through a channel by Chezy's formula. 7

(b) Find the discharge through a circular pipe of diameter 4·0 m, if the depth of water in the pipe is 1·33 m and pipe is laid at a slope of 1 in 1500. Take the value of Chezy's constant = 60. 7