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BICE-028

DIPLOMA – VIEP – MECHANICAL ENGINEERING (DMEVI)

Term-End Examination

00536

June, 2016

BICE-028 : FLUID MECHANICS

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt **five** questions in all. Question no. **1** is **compulsory** and **four** questions are to be attempted out of questions no. 2 to 8. Use of scientific calculator is permitted. Assume missing data, if any.*

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

(iii) shear stress is directly proportional to the shear strain

(iv) shear stress is directly proportional to the viscosity

(b) Dynamic viscosity (μ) has the dimensions as

(i) MLT^{-2}

(ii) $ML^{-1}T^{-1}$

(iii) $ML^{-1}T^{-2}$

(iv) $M^{-1}L^{-1}T^{-1}$

(c) Pascal's law states that the pressure at a point is equal in all directions

(i) in a liquid at rest

(ii) in a fluid at rest

(iii) in a laminar flow

(iv) in a turbulent flow

(d) The flow in a pipe is laminar if

(i) Reynolds number = 2500

(ii) Reynolds number = 4000

(iii) Reynolds number > 2500

(iv) None of the above

(e) An orifice is known as a large orifice when the head of liquid from the centre of the orifice is

(i) more than 10 times the depth of the orifice

(ii) less than 10 times the depth of the orifice

(iii) less than 5 times the depth of the orifice

(iv) None of the above

(f) Continuity equation deals with the law of

(i) mass

(ii) momentum

(iii) energy

(iv) None of the above

(g) The range for coefficient of discharge (C_d) for a venturimeter is

(i) 0·6 to 0·7

(ii) 0·7 to 0·8

(iii) 0·8 to 0·9

(iv) 0·95 to 0·99

2. (a) Calculate the specific weight, density, specific volume and relative density of one litre of petrol which weighs 0·7 kgf. *4*

(b) Define surface tension. *2*

(c) Derive the relationship between surface tension and pressure inside a droplet of liquid in excess of outside pressure. *8*

3. (a) Describe the principle of conservation of energy with the help of a mathematical expression. *4*

(b) Derive Euler's equations of motion. *10*

4. (a) An oil of specific gravity 0·8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the discharge through the horizontal venturimeter.
(Take $C_d = 0·98$) *8*

(b) Describe any two practical applications of Bernoulli's equation. *6*

5. (a) A circular tank of diameter 4 m contains water up to a height of 5 m. The tank is provided with an orifice of diameter 0·5 m at the bottom. Find the time taken by water to fall from 5 m to 2 m. *7*

(b) A circular tank of diameter 1·25 m contains water up to a height of 5 m. An orifice of 50 mm diameter is provided at its bottom. If $C_d = 0·62$ (Coefficient of discharge), find the height of water above the orifice after 1·5 minutes. *7*

6. (a) A main pipe divides into two parallel pipes which again forms one pipe as shown in Figure 1.

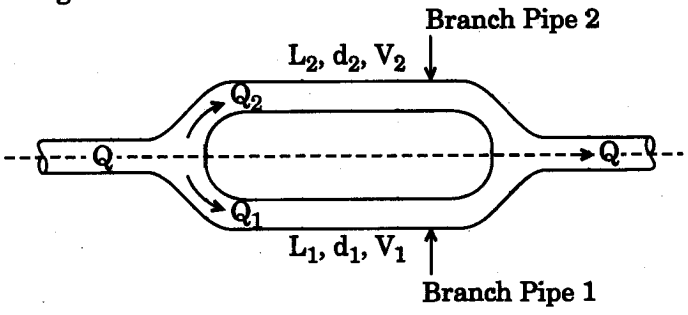

Figure 1

The length and diameter for the first parallel pipe are 2000 m and 1·0 m respectively, while the length and diameter of the second parallel pipe are 2000 m and 0·8 m respectively. Find the rate of flow in each parallel pipe, if the total flow in the main is 3·0 m^3/sec. (Assume coefficient of friction = 0·005) *8*

(b) Find the discharge through a rectangular channel of width 2 m, having a bed slope of 4 in 8000. The depth of flow is 1·5 m and the value of n in Manning's formula is 0·012. *6*

7. (a) Derive an expression for the condition for maximum velocity of water for a circular section. *7*

(b) Determine the maximum discharge of water through a circular channel of diameter 1·5 m when the bed slope of the channel is 1 in 1000. Take c = 60. 7

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

(a) Darcy-Weisbach equation for flow through pipes

(b) Turbulent flow and Uniform flow

(c) Continuity equation

(d) Ideal fluid vs Real fluid

(e) Coefficient of contraction and Coefficient of discharge

(f) Submerged orifice