No. of Printed Pages : 5

BET-037

DIPLOMA IN CIVIL ENGINEERING (DCLE(G)) / DIPLOMA IN MECHANICAL ENGINEERING (DME)

00692

Term-End Examination

June, 2019

BET-037 : FLUID MECHANICS

Time : 2 hours *Maximum Marks : 70*

Note : *All questions are* ***compulsory****. All questions carry equal marks. Use of scientific calculator is permitted.*

1. Choose the correct answer from the given alternatives. *7×2=14*

(a) An ideal fluid is defined as the fluid which

(i) is compressible

(ii) is incompressible

(iii) is incompressible and non-viscous

(iv) has negligible surface tension

(b) Stoke is the unit of

(i) surface tension

(ii) viscosity

(iii) kinematic viscosity

(iv) None of the above

(c) Gauge pressure at a point is equal to

(i) absolute pressure plus atmospheric pressure

(ii) absolute pressure minus atmospheric pressure

(iii) vaccum pressure plus absolute pressure

(iv) None of the above

(d) The flow in a pipe is laminar if

(i) Reynolds number is equal to 2500

(ii) Reynolds number is equal to 4000

(iii) Reynolds number is more than 2500

(iv) None of the above

(e) The flow rate through a circular pipe is measured by

(i) pitot-tube

(ii) venturimeter

(iii) orifice-meter

(iv) Both (ii) and (iii)

(f) The coefficient of discharge (C_d) in terms of C_v and C_c is

(i) $C_d = \frac{C_v}{C_c}$

(ii) $C_d = C_v \times C_c$

(iii) $C_d = \frac{C_c}{C_v}$

(iv) None of the above

(g) The velocity distribution in laminar flows through circular pipe follow the

(i) parabolic law

(ii) linear flow

(iii) logarithmic law

(iv) None of the above

2. Answer any ***two*** of the following : *2×7=14*

(a) Derive the expression for hydrostatic force on a submerged plane surface.

(b) Derive an expression for Bernoulli's theorem from first principle and state the assumptions made for such a derivation.

(c) A tank contains water of density 1000 kg/m^3 upto a height of 3 m above the base. An immiscible liquid of specific gravity 0·8 is filled on top of that over 2 m depth. Calculate the pressure at a point 1·5 m below the free surface, at the interface and at another point 2·5 m below the free surface. Sketch the pressure variation.

3. Answer any ***two*** of the following : 7

(a) An orifice meter with orifice diameter 10 cm is inserted in a pipe of 20 cm dia. The pressure gauges fitted upstream and downstream of the orifice meter give readings of 19·62 N/cm^2 and 9·81 N/cm^2 respectively. Coefficient of discharge for the meter is given as 0·6. Find the discharge through the pipe.

(b) Differentiate between the following : $2\times3\frac{1}{2}=7$

(i) Dynamic and Kinematic viscosity with their units of measurements

(ii) Steady and Unsteady flow

(c) The velocity distribution in a circular pipe of radius R is given by

$$V = V_{max}\left(1 - \frac{V^2}{R^2}\right)$$

where V is the velocity at radius R and V_{max} is the velocity at the centre. Calculate the mean velocity. 7

4. Answer any ***two*** of the following :

(a) Derive expression for discharge through a submerged orifice. 7

(b) An internal mouthpiece has a dia of 4 cm. If the head above the mouthpiece is 1·5 m and coefficient of velocity is 0·95, determine the coefficients of contraction and discharge when the mouthpiece is running free. 7

(c) The rate of flow of water through a horizontal pipe is 0·25 m^3/s. The diameter of pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is 11·772 N/cm^2. Determine

(i) Loss of head due to sudden enlargement, and

(ii) Pressure intensity in the large pipe. $2 \times 3\frac{1}{2} = 7$

5. Answer any ***two*** of the following :

(a) Derive Darcy – Weisbach equations for frictional loss in pipe. 7

(b) A hydraulic machine is supplied with water through a pipe 1000 m long. Gauges fitted to the supply pipe show pressure of 5886 kN/m^2 at the upstream end and a pressure of 5395·5 kN/m^2 at the machine. If the power supplied to the machine is 44·145 kW (60 hp), determine the diameter of the pipe. Take f = 0·03. 7

(c) Write short notes on the following : $2 \times 3\frac{1}{2} = 7$

(i) Minor Losses in Pipes

(ii) Venturimeter