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BET-037

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

00643 **Term-End Examination**

December, 2019

BET-037 : FLUID MECHANICS

Time : 2 hours *Maximum Marks : 70*

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

1. Select the correct alternative : *7×2=14*

(a) Kinematic viscosity is defined as equal to

(i) Dynamic viscosity × Density

(ii) Dynamic viscosity / Density

(iii) Dynamic viscosity × Pressure

(iv) Pressure × Density

(b) Pitot tube is used for measurement of

(i) pressure

(ii) flow

(iii) velocity at a point

(iv) discharge

(c) Bernoulli's theory deals with the law of conservation of

(i) mass

(ii) momentum

(iii) energy

(iv) None of the above

(d) Continuity equation deals with the law of conservation of

(i) mass

(ii) momentum

(iii) energy

(iv) None of the above

(e) Hydraulic gradient line represents the sum of

(i) pressure head and kinetic head

(ii) kinetic head and datum head

(iii) pressure head, kinetic head and datum head

(iv) pressure head and datum head

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

(i) H

(ii) $\sqrt{H}$

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

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

(g) Orifices are used to measure

(i) velocity

(ii) pressure

(iii) rate of flow

(iv) None of the above

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

(a) Explain the phenomenon of capillarity and surface tension. Obtain an expression for capillary rise of a liquid.

(b) State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's equation from first principle and the assumptions made for such a derivation.

(c) A tank contains water up to a height of 0·5 m above the base. An immiscible liquid of sp. gr. 0·8 is filled on top of the water up to 1 m height. Calculate the

(i) total pressure on one side of the tank, and

(ii) position of centre of pressure for one side of the tank which is 2 m wide.

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

(a) In a 100 mm diameter horizontal pipe, a venturimeter of 0·5 contraction ratio has been fixed. The head of water on the meter when there is no flow is 3 m (gauge). Find the rate of flow to which the throat pressure will be 2 m of water absolute. The coefficient of meter is 0·97.
Take atmospheric head = 10·3 m of water.

(b) Differentiate between the following :

(i) Ideal fluids and Real fluids

(ii) Irrotational flow and Rotational flow

(c) A circular orifice 3·5 cm dia, is made in the vertical wall of a tank. The jet falls vertically through 0·5 m while moving horizontally through a distance of 1·5 m. Calculate the discharge if the head causing flow is 1·2 metres. $C_c = 0·62$.

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

(a) Write short notes on the following :

(i) Continuity Equation

(ii) Orifice Meter

(b) Derive Chezy's equation to find velocity of flow in open channel.

(c) Two reservoirs are connected by 2 pipes of the same length laid in parallel. The diameters of pipe are 10 cm and 30 cm respectively. If the discharge through 10 cm dia pipe is 0·01 cumecs, what will be the discharge through 30 cm pipe ? Assume that f is the same for both pipes.

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

(a) The cross-section of an open channel is a trapezium with a bottom width of 4 m and slide slopes 1 vertical to 2 horizontal. Calculate the discharge if the depth of water is 1·5 m and S = 1/1600. Use Chezy's formula C = 50.

(b) At a sudden enlargement of a water main from 240 mm to 480 mm dia, the hydraulic gradient rises by 10 mm. Estimate the rate of flow.

(c) Write short notes on the following :

(i) Minor Losses in Pipes

(ii) Laminar Flow in Pipes