3E1625

Roll No. _____

Total No. of Pages : 4

3E1625

B. Tech. (Sem. III) (Main/Back) Examination, December - 2017
Civil Engg.
3CE5A Fluid Mechanics

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting materials is permitted during examination.

1. Nil 2. Nil

UNIT - I

1 (a) Enunciate Newton's law of viscosity. Explain the importance of viscosity in fluid motion. What is the effect of temperature on viscosity of water and that of air ? **8**

(b) The dynamic viscosity of oil, used for lubrication between a shaft and sleeve is 6 poise. The shaft is 0.4 m and rotates at 190 r.p.m. Calculate the power lost in the bearing for a sleeve length of 90 mm. The thickness of the oil film is 1.5 mm. **8**

OR

1 (a) Write short notes on any four :
(i) Specific weight, Specific volume and Specific gravity.
(ii) Compressibility and Bulk modulus of compressibility.
(iii) Surface tension and capillarity.
(iv) Vapour pressure and cavitations.
(v) Different types of fluids.

4×4=16

UNIT - II

2 (a) Explain the different types of measurement of pressure in Fluid with neat sketch. Also give the expression for pressure in inclined single column manometer.

10

(b) A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of sp. gr. 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere, Find the vacuum-pressure in pipe, if the difference of mercury level in the two limbs is 40 cm and the height of fluid in the left from the centre of pipe is 15 cm below.

6

OR

2 (a) What is meta-centre ? Explain the analytical method of determination of meta-centric height.

8

(b) A uniform body of size 3 m long x 2 m wide x 1 m deep floats in water. What is the weight of the body if depth of immersion is 0.8 m? Determine the meta-centric height also.

8

UNIT - III

3 (a) Determine the equation of motion by Euler's equation of motion. Also explain Bernoulli's equation from Euler's equation. Give all the assumptions made in Bernoulli's equation.

10

(b) A pipe, through which water is flowing, is having diameters, 20 cm and 10 cm at the cross-sections 1 and 2 respectively. The velocity of water at section 1 is given 4.0 m/s. Find the velocity at sections 1 and 2; also rate of discharge.

6

OR

3 (a) Explain velocity potential function and stream function. 6

(b) The velocity potential function (ϕ) is given by an expression

$$\phi = -\frac{xy^3}{3} - x^2 + \frac{yx^3}{3} + y$$

(i) Find the velocity components in x and y direction

(ii) Show that ϕ represents a possible case of flow. 10

UNIT - IV

4 (a) What are the different applications of Bernoulli's equation ? Give the expression for rate of flow through venturimeter. 10

(b) An oil of sp.gr. 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 of oil through the horizontal venturimeter. Take $C_d = 0.98$. 6

OR

4 (a) Give the classification of Notches and weirs. Find the discharge over a triangular notch and stepped notch. 10

(b) Find the discharge through the notch for given figure, if C_d for all section = 0.62.

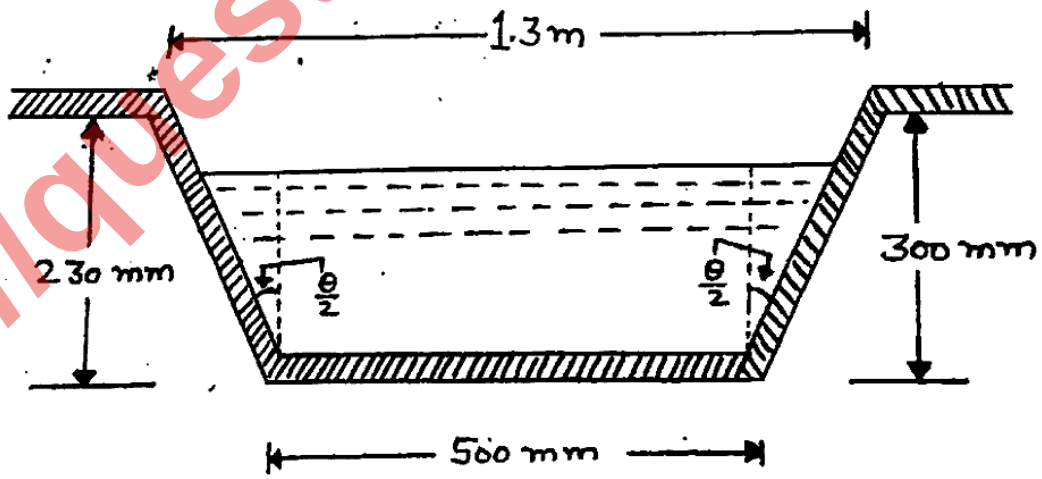

Figure 6

UNIT - V

5 (a) What are the different losses of energy in pipes? Derive Chezy's formula for loss of head due to friction in pipes. 8

(b) Find the head lost due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3 m/s using (i) Darcy's formula (ii) Chezy's formula for which C = 60, kinematic viscosity for water is 0.01 stoke. 8

OR

5 (a) Find an expression for the power transmission through pipes. What is the condition for maximum transmission of power and corresponding efficiency of transmission ? 8

(b) A pipe of diameter 300 mm and length 3500 m is used for the transmission of power by water. The total head at the inlet of the pipe is 500 m. Find the maximum power available at the outlet of the pipe, if the value of f =006. 8