3028

B. Tech 3rd Semester (Civil Engg.)
Examination – December, 2019
FLUID MECHANICS
Paper : PCC-CE-205-G

Time : Three Hours] [Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question Number **1** is *compulsory*. All questions carry equal marks.

1. Explain the following : $3 \times 5 = 15$

   (a) Effect of temperature on viscosity of fluid.

   (b) Absolute, gauge and vacuum pressure.

   (c) Continuity Equation.

   (d) Limitations of Bernoulli's equation.

   (e) Smooth and rough boundaries.

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UNIT – I

2. Why does dynamic viscosity have the prefix "dynamic" and "kinematic" ? 15

3. The velocity components in a two dimensional incompressible flow field are expressed as : 15

$$u = y^3/3 + 2x - x^2 y, v = xy^3 - 2y - x^3/3$$

Is the flow physically possible ? If so, obtain an expression for the stream function. What is the discharge between the streamlines passing through (1,3) and (2,3) ?

UNIT – II

4. Describe briefly the experimental method of determination of the metacentric height of a floating object. 15

5. A simple u-tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmospheric. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 400mm and the height of fluid in the left limb from the centre of pipe is 150mm below. 15

UNIT – III

6. The horizontal 7m long pipe is tilted at an angle of 30°. At the lower level, the section of the pipe is of 80mm diameter and at the upper level, the section of the pipe is of 240mm diameter. If the pipe is equally tapering and the velocity of water at the lower section is 1.5 m/s, calculate the difference of pressures between the upper and lower sections.   15

7. (a) Derive an expression for continuity equation for a three dimensional flow.   10

   (b) Explain in details one, two and three dimensional flow.   5

UNIT – IV

8. (a) Describe in details : Boundary-layer thickness, Laminar boundary, Laminar sub-layer boundary.

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   (b) Write down the assumptions and concept of boundary-layer theory.   5

9. (a) Write down the important dimensionless numbers and their significance.   10

   (b) Describe and derive Buckingham theorem.   5

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