Total No. of Questions : 4]

SEAT No. : ____

PA-3

[Total No. of Pages : 2

[5931]-3

S.E. (Civil)

201003 : FLUID MECHANICS

(2019 Pattern) (Semester - I)

Time : 1 Hour] ***[Max. Marks : 30***

Instructions to the candidates :

1) ***Answer Q1 or Q2, Q3 or Q4.***
2) ***Answers to the all questions should be written in single answer-book.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator (non programmable) and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) a) If the velocity distribution over a plate is given by $u = \frac{2}{3}y - y^2$ in which u is the velocity in meter per second at a distance y meters above the plate, determine the shear stress at $y = 0$ and $y = 0.16$ m. Take dynamic viscosity of fluid as 8.65 poise. **[8]**

b) Derive the expression with usual notations for the total pressure and centre of pressure on vertical plane surface. **[7]**

OR

Q2) a) A vertical gate closes a horizontal tunnel 5m high and 3 m wide running full with water. The pressure at the bottom of the gate is 196 KN/m^2. Determine the total pressure on the gate and the position of the centre or pressure. **[7]**

b) Define : i) Mass Density ii) Specific Gravity iii) Specific Weight iv) Specific Volume v) Capillarity vi) Viscosity vii) Surface Tension viii) Vapor pressure **[8]**

P.T.O.

Q3) a) The velocity components in a two-dimensional flow field for an incompressible fluid are expressed as :

$$u = \frac{y^3}{3} + 2x - x^2 y,\ v = xy^2 - 2y - \frac{x^3}{3}$$

Obtain an expression for the stream function Ψ. **[7]**

b) Derive Euler's equation of motion along a streamline and obtain the Bernoulli's Equation from it. State also the assumptions made for it. **[8]**

OR

Q4) a) What is meant by HGL and TEL? Explain it with neat sketch. **[4]**

b) Explain Venturimeter in detail with neat sketch. **[4]**

c) A 30 cm diameter pipe, conveying water, branches into two pipes of diameters 20 cm and 15 cm respectively. If the average velocity in the 30 cm diameter pipe is 2.6 m/s, find the discharge in this pipe. Also, determine the velocity in 15 cm pipe if the average velocity in 20cm diameter pipe is 2.1 m/s. **[7]**