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Paper Code: CE-509	**Roll No.**									

B. TECH.
FIFTH SEMESTER EXAMINATION, 2016-2017
FLUID MECHANICS

[Time: 2 Hours] [Total Marks: 50]

Note: Attempt all Questions. All Question carry equal marks

1. Attempt any **FOUR** questions from the following: **(5x4 =20)**

(a) What do you understand by continuum and why it is necessary for fluid Mechanics?

(b) Differentiate in between the following terms:
   i. Surface tension and Capillarity
   ii. Kinematics and dynamics of fluid

(c) Discuss how Eulerian fluid motion is different from Lagrangian fluid motion.

(d) Differentiate in between Velocity potential and Stream Function. Also give relationship Between both the terms.

(e) Obtain expression for continuity equation for 3-D flow. And also give the assumptions.

(f) What do you understand by Velocity potential?
The velocity potential function is given by an expression
$\varphi = -\frac{xy^3}{3} - x^2 + \frac{x^3y}{3} + y^2$
Find velocity components in x and y direction.

2. Attempt any **TWO** questions from the following: **(10 x 2= 20)**

(a) Show that the distance between the meta-center and the center of buoyancy is given by BM = I/V
I = Moment of inertia of the plan of the floating body at water surface about horizontal axis
V= Volume of the body submerged in liquid.
A rectangular pontoon is 5 m long, 3 m wide and 1.20 m high. The depth of immersion of the pontoon is .80 m in sea water. If the centre of gravity is 0.6 m above the bottom of the pontoon, determine the meta-centric height. The density for sea water = 1025 kg/m^3

(b) Derive Euler equation of motion listing all the assumption. And also obtain expression for Bernoulli's equation from it. A pipe diameter 400 mm carries water at a velocity of 25m/s. The pressure at the

points A and B are given as 29.43 N/cm^2 and 22.53 N/cm^2 resp. while the datum head at A and B are 28 m and 30 m. Find the loss of head between A and B.

(c) Explain the Principle of Pitot-tube with the help of neat sketch. And derive the expression for the velocity of fluid flowing through it.

3. Attempt any **TWO** questions from the following: **(10 x 2= 20)**

(a) Find an expression for the loss of head of a viscous fluid flowing through a circular pipe.

(b) What is Hagen Poiseuille's formula? Derive an expression for Hagen Poiseuille's formula.

(c) What do you mean by Prandtl mixing length theory? Find an expression for shear stress due to Prandtl.

4. Attempt any **TWO** questions from the following: **(10 x 2= 20)**

(a) The time period (t) of a pendulum depends upon the length (L) of the pendulum and acceleration due to gravity (g). Derive an expression for the time period

(b) Explain impulse momentum equation. A nozzle of diameter 20 mm is fitted to apipe of diameter 40 mm. Find the force exerted by the nozzle on the water which is flowing through the pipe at the rate of 1.2 m^3/min.

(c) Obtain an expression for the loss of head due to :

(i) Sudden enlargement of pipe

(ii) Sudden contraction of pipe

Also list all the assumption.