Total No. of Questions—**12**] [Total No. of Printed Pages—**3**

Seat No.	

[5559]-104

S.E. (Civil) (Second Semester) EXAMINATION, 2019

FLUID MECHANICS—I

(2015 PATTERN)

Time : 2 Hours **Maximum Marks : 50**

Instruction to candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Neat sketches must drawn wherever necessary.***
3) ***Figures to right indicate full marks.***
4) ***Assume suitable data if necessary.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Use of cell phone is prohibited during examination.***

Q1) a) Define: (02)

(i) Mass density

(ii) Specific gravity

b) Define gauge pressure and vacuum pressure (03)

OR

Q2) a) Explain Newton's law of viscosity (03)

b) Explain the theory of surface tension. (02)

Q3) a) Enlist various Pressure measuring devices (02)

b) Define Pascal's Law. (03)

P.T.O.

OR

Q4) a) Define buoyancy, Metacentre and metacentric height (03)

b) Write down the condition for floating bodies (02)

Q5 a) Write short note on stream line, stream tube, path line, and streak line. (03)

b) Distinguish between compressible & incompressible, rotational & irrotational flow. (02)

OR

Q6) a) Define: steady flow, unsteady flow, uniform flow and non-uniform flow. (02)

b) Explain velocity and acceleration. Also mention its type (03)

Q7) a) What are the assumptions of Bernoulli's equation (02)

b) Define Hydraulic grade line and total energy line (03)

OR

Q8) a) Explain the working of Venturimeter (02)

b) Define coefficient of contraction, coefficient of discharge and coefficient of velocity (03)

Q9) a) Explain with neat sketches "Boundary layer separation and its control" (04)

b) In case of laminar flow, through a circular pipe, show that ratio of maximum velocity to average velocity =2.0 (05)

c) Find the displacement thickness, the momentum thickness and energy thickness for the velocity distribution in the boundary layer given by $u/U = y/\delta$, where u is the velocity at a distance y from the plate and $u = U$ at $y = \delta$, where δ = boundary layer thickness. (06)

OR

Q10) a) Derive the expression for "loss of head due to sudden enlargement" in case of flow through a pipe (05)

b) The rate of flow of water through a horizontal pipe is 0.25 m3/s. The diameter of the pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is 11.772 N/cm2.

Determine:

(*i*) Loss of head due to sudden enlargement

(*ii*) Pressure intensity in the large pipe

(*iii*) Power lost due to enlargement (06)

c) Explain Stokes' law and state its assumptions. (04)

Q11) a) Explain in brief with neat sketches

I. Prandtl's mixing length theory

II. Velocity distribution in turbulent flow (05)

b) Three pipes ,300m long and 300mm diameter, 150m long and 200mm dia. 200m long 250mm dia. are connected is connected in series in same order. Pipe having 300mm diameter is connected to the reservoir. Water level in the reservoir is 15m above the centreline of the pipe which is horizontal. The respective friction factors for the pipes are 0.018, 0.02, and 0.019. Determine.

i) Flow rate

ii) Magnitude of loss of head in each pipe (06)

c) What is equivalent pipe? Derive the dupit equation for equivalent pipe (04)

OR

Q12) a) Two similar pipes of same diameter of length L1 and L2 are placed in parallel. Calculate the equivalent length of a single pipe of the same diameter. What would be the equivalent length if the two pipes were equal in length? (06)

b) Establish relation between Darcy-weisbach friction factor and Reynold's number for laminar flows in pipe (05)

c) Explain any four characteristics of turbulent flow (04)