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Code No: 133AV

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, November/December - 2017

FLUID MECHANICS – I

(Common to CE, CEE)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A **(25 Marks)**

1.a)	State and explain Pascal's law.	[2]
b)	Differentiate centre of gravity and centre of pressure.	[3]
c)	Differentiate fluid statics and kinematics.	[2]
d)	State and explain continuity equation.	[3]
e)	Distinguish between surface and body forces.	[2]
f)	Describe the classification of orifices.	[3]
g)	Explain how flow takes place in closed conduits.	[2]
h)	Explain HGL and TEL with a neat sketch.	[3]
i)	Give Navier Stoke's equation.	[2]
j)	Distinguish between drag and lift.	[3]

PART-B **(50 Marks)**

2.a) Define Viscosity, Surface tension and Vapor Pressure and explain their influence on fluid motion.

b) An open tank contains water up to a depth of 1.5 m and above it an oil of sp.gr.0.8 for a depth of 2 m. Find the pressure intensity: (i) at the interface of the two liquids, and (ii) at the bottom of the tank. [5+5]

OR

3.a) Distinguish between:
i) specific weight and specific volume,
ii) density and relative density and
iii) adhesion and cohesion.

b) 10 m^3 of carbon tetrachloride reduces in volume by 0.11 percent when subjected to certain pressure increase. If the bulk modulus of the fluid is $1.145\times10^6\ N/m^2$, the original specific weight is 15,750 N/ m^3, calculate the increase in pressure and the final specific weight. [5+5]

4.a) Distinguish between: (i) Steady flow and un-steady flow, (ii) Uniform and non-uniform flow, (iii) Compressible and incompressible flow, (iv) Rotational and Irrotational flow (v) Laminar and turbulent flow.

b) A 100 mm diameter pipe carries oil of specific gravity 0.8 which flows with a velocity of 2 m/s. At another section of the pipe, the diameter is 50 mm. Determine the mass flow rate of oil through the pipe and velocity of oil at the smaller section. [5+5]

OR

5.a) Explain stream function and velocity potential function.

b) Examine whether the following velocity components represent a possible incompressible two-dimensional flow. If so, state whether the flow is rotational or irrotational $u = 2x+y$ and $v = x-2y$. [5+5]

6.a) What is a Venturimeter? Derive an expression for the discharge through a Venturimeter.

b) An orifice-meter with orifice diameter 15 cm is inserted in a pipe of 30 cm diameter. The pressure gauges fitted upstream and downstream of the orifice meter give readings of 14.715 N/cm^2 and 9.81 N/cm^2 respectively. Find the rate of flow of water through the pipe in liters/s. Take Cd = 0.6. [5+5]

OR

7.a) Derive Bernoulli's equation for the flow of an incompressible frictionless fluid from consideration of momentum.

b) A 45^0 reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 40 cm and 20 cm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet of bend is 21.58 N/cm^2. The rate of flow of water is 500 liters/s. [5+5]

8.a) What do you mean by equivalent pipe. Obtain an expression for equivalent pipe.

b) A pipe of diameter 300 mm and length 1000 m connects two reservoirs, having difference of water levels as 15 m. Determine the discharge through the pipe. If an additional pipe of diameter 300 mm and length 600 m is attached to the last 600 m length of the existing pipe, find the increase in the discharge. Take f = 0.02 and neglect minor losses. [5+5]

OR

9.a) Show that the loss of head due to sudden expansion in pipe line is a function of velocity head.

b) Describe the characteristics of laminar and turbulent flows. [5+5]

10.a) What is meant by boundary layer separation? What is the effect of pressure gradient on boundary layer separation?

b) Explain the factors affecting boundary layer thickness. [5+5]

OR

11.a) Explain the terms boundary layer, laminar sub-layer and point of separation.

b) Describe the characteristics of boundary layer with reference to flow over a flat plate. [5+5]

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