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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2018
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) Distinguish between specific weight and specific gravity. [2]
b) Explain bulk modulus and compressibility. [3]
c) What is velocity potential function? [2]
d) What is meant by liquids in relative equilibrium? [3]
e) What is broad crested weir? [2]
f) Explain Navier Stoke's equation along with its significance. [3]
g) List out all major and minor losses. [2]
h) Explain what water hammer is. [3]
i) Explain Prandtl boundary layer equations. [2]
j) What is magnus effect? Explain. [3]

PART-B

(50 Marks)

2.a) Differentiate between:
i) Liquids and Gases
ii) Cohesion and Adhesion
iii) Real fluid and Ideal fluid
iv) Compressible and Incompressible fluids.
b) In a stream of glycerin in motion, the velocity gradient at a certain point is 0.30 meters per sec per meter. Calculate the shear stress at the point if the mass density of the liquid is 1275 kg/m^3 and the kinematic viscosity is 6.30 $\times 10^{-4}$ sq.m/sec. [5+5]

OR

3.a) Distinguish between (i) standard and local atmospheric pressures, (ii) barometric pressure and absolute pressure and (iii) absolute pressure and gauge pressure.
b) Determine the intensity of shear of an oil having viscosity = 1.2 poise and is used for lubrication in the clearance between a 10 cm diameter shaft and its journal bearing. The clearance is 1.0 mm and shaft rotates at 200 rpm. [5+5]

4.a) Define the equation of continuity. Obtain an expression for continuity equation for a three dimensional flow.
b) Water is flowing through a pipe having diameters 30 cm and 15 cm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 29.43 N/cm^2 and the pressure at the upper end is 14.715 N/cm^2. Determine the difference in datum head if the rate of flow through pipe is 50 lit/s. [5+5]

OR

5. Write short note on:
   a) Buoyancy and flotation
   b) Circulation and Vorticity
   c) Flow net. [10]

6.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]

OR

7.a) Explain the momentum equation along with its applications.

b) A 10 cm by 6 cm orifice meter is used to measure the discharge of bromine. If the pressure difference across the orifice plate is 18250 N/m^2, determine the discharge in lit/m. Assume Cd = 0.64. Specific gravity of bromine = 3.1. [5+5]

8.a) Obtain an expression for head loss due to friction in the pipe. List all the assumptions made in the derivation.

b) Explain how the following flow problems are analyzed:
(i) Series pipe connection and (ii) parallel pipe connection. [5+5]

OR

9.a) Describe Reynolds experiment with a neat sketch.

b) A horizontal pipe of diameter 400 mm is suddenly contracted to a diameter of 200 mm. The pressure intensities in the large and smaller pipe are given as 14.715 N/cm^2 and 12.753 N/cm^2 respectively. If Cc = 0.62, find the loss of head due to contraction. Also determine the rate of flow of water. [5+5]

10.a) Describe Von-Karman's momentum integral equation. What is the significance of it?

b) Explain what is meant by drag, lift and Magnus effect. [5+5]

OR

11.a) What do you mean by boundary layer separation. What is the effect of pressure gradient on boundary layer separation?

b) How will you find the drag on a flat plate due to laminar and turbulent boundary layers? [5+5]

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