B.Tech II Year II Semester (R09) Supplementary Examinations May/June 2017

MECHANICS OF FLUIDS

(Aeronautical Engineering)

Time: 3 hours Max. Marks: 70

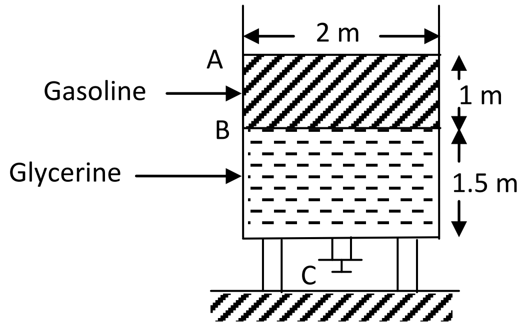
Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Define the properties specific weight, viscosity, vapour pressure and compressibility of a fluid.

(b) The tank and drainpipe in the following figure are filled with gasoline and glycerin to the depths shown. Find the pressure on the drain plug at C. Express the answer as a pressure head in 'm' of water. Take $\rho_{ga} = 726\ kg/m^3$ & $\rho_{gl} = 1260\ kg/m^3$.



2 (a) In a two-dimensional incompressible flow the fluid velocity components are given by $u = x - 4y$ and $v = -y - 4x$. Show that velocity potential exists and determine its form.

(b) Give the classification of flows.

3 (a) What is momentum equation? Also give its applications.

(b) Water is flowing through a pipe of 120 mm diameter under a pressure of 20 N/cm^2 (gauge) and with mean velocity of 3.2 m/s. Find the total head of the water of a cross-section which is 8 m above the datum line.

4 Compare and contrast venturi meter and orifice meter.

5 (a) Find the displacement 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 $y = \sigma$ where δ = boundary layer thickness.

(b) What is Magnus effect?

(c) Define drag. Also give the different types of drag with definitions.

6 (a) Explain Reynold's experiment.

(b) A pipe of 60 m long and 150 mm in diameter is connected to a water tank at one end and flows freely into the atmosphere at the other end. The height of water level in the tank is 2.6 m above the center of the pipe. The pipe is horizontal and f = 0.01. Find the discharge through the pipe in lps if all the minor losses are to be considered.

7 Derive the expression to find the velocity at a particular point for a case of laminar flow through a horizontal circular pipe. Also derive the expression to find the pressure drop for a given length of pipe.

8 (a) When do you call the flow as sonic, sub-sonic & super-sonic flow?

(b) Find the speed of the sound wave in air at sea-level where the pressure and temperature are 10.1043 N/cm^2 (abs) and 15°C respy. Take R = 287 J/kg°K and K = 1.4.

*****