Code No: NR222101 **NR**

II B.Tech II Semester Supplementary Examinations, April/May 2005
FLUID MECHANICS AND MACHINERY
(Aeronautical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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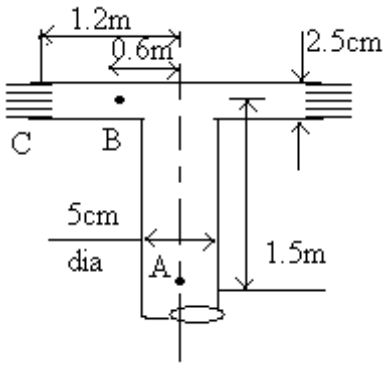
1. (a) If 5.27 m^3 of a certain oil weighs 4482 kg. Calculate the specific weight, mass density and specific gravity of the oil.
   (b) At the top of a mountain the temperature is -5^oC and a mercury barometer reads 56.6 cm, where as the reading at the foot of the mountain is 74.9. Assume dry adiabatic conditions with R=287 joules per (kg(m) deg.C abs), calculate the height of the mountain?

2. (a) Water flows radially between the two flanges at the end of a 15cm diameter pipe as given in figure. Neglecting the losses, if the pressure head at A is –0.3 m, find the pressure head at B and the flow in m^3/sec.



   (b) Explain different energies of a fluid.

3. (a) What are the factors affecting the boundary layer thickness.
   (b) Air flows over a flat plate 1m long at a velocity of 6m/sec. Determine
      i. the boundary layer thickness at the end of the plate
      ii. shear stress at the middle of the plate.
      iii. Total drag force per unit length on the sides of the plate take ρ =0.125msl/m^3 and v=0.15 stokes for air.

4. (a) Why should circulation superimposed on flow past a body cause a lift?
   (b) A cylinder of 0.5m diameter is rotated at 540 r.p.m. in air stream of velocity 12m/sec. If it develops a lift of 9.8 kg per metre length of the cylinder, determine the ratio of actual to the theoretical lift. Take ρ=0.126 msl./m^3.

5. (a) Explain the working of a Hot wire anemometer used to measure fluid flow rate.

(b) A venturi meter has its axis vertical, the inlet and throat diagmeters being 15cm and 7.5 cm respectively. The throat is 22.5cm above inlet and k=0.96; petrol of specific gravity 0.78 flows up through the meter at a rate of 0.029 m^3/sec. Find the pressure difference in kgf/cm^2 between inlet and throat.

6. (a) Air at an absolute pressure of 1.03kgf/cm^2 ad 15^oC with zero velocity expands isentropically to M_a=0.5. Calculate
   i. the final pressure
   ii. the final density
   iii. the temperature.

   (b) Differentiate subsonic, Transonic and supersonic flows.

7. (a) Considering the variation of velocity with area, prove that $\frac{dA}{dV} = \frac{A}{V}(Ma^2 - 1)$ and explain the variation of velocity with change in area for the subsonic and supersonic velocities.

   (b) What is one dimensional isontropic flow? Explain.

8. Write short notes and any FOUR of the following:

   (a) Laplace equation

   (b) Euler's energy transfer equation

   (c) Lift and drag coefficients

   (d) Laser daptler anemometer

   (e) Incompressible fluid flows.

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