

II B.Tech II Semester Supplementary Examinations, April/May 2006
FLUID MECHANICS AND MACHINERY
(Aeronautical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain the phenomenon of capillarity. Obtain an expression for capillary rise of a liquid. [8]
(b) A piston 796 mm diameter and 200 mm long works in a cylinder of 800 mm diameter. If the annular space is filled with a lubricating oil of viscosity 5 centi poise, calculate the speed of descent of the piston in vertical position. The weight of the piston and axial load are 9.81N. [8]
2. (a) When will centre of pressure and centre of gravity of an immersed plane surface coincide. Derive an expression for the force exerted and centre of pressure for a completely submerged inclined plane surface. [10]
(b) Determine the total pressure and centre of pressure of an isosceles triangular plate of base 5m and altitude 5m when the plate is immersed vertically in an oil of specific gravity 0.8. The base of the plate is 1m below the free surface of water. [6]
3. (a) Show from the consideration of vorticity and rotation that in case of ideal fluids the flow is irrotational. [8]
(b) Define the following and give one practical example for each. [8]
 - i. Steady Flow and Unsteady Flow
 - ii. Rotational Flow and Irrotational Flow
 - iii. Uniform and Non-uniform Flow
4. (a) Explain Reynolds and Mach numbers. What is the significance of these two numbers. [8]
(b) A pipe 300m long has a slope of 1 in 100 and tapers from 1.2m diameter at the high end to 0.60m diameter at the low end. Quantity of water flowing is 5400 litres per minute. If the pressure at the high end is 0.70 kg/cm^2 . Find the pressure at the low end. Neglect losses. [8]
5. (a) Discuss the concept of the boundary layer with reference to fluid motion over a flat plate, phenomenon of separation for flow over curved surfaces, and the prevention of separation. [8]
(b) Obtain an expression for the boundary shear stress in terms of momentum thickness. [8]
6. (a) What is a Rotameter. Explain the working of a Rotameter. [8]

- (b) Explain the working of a Pitot Static Tube with a neat sketch. [8]
7. (a) Explain different compressible flow regimes. [6]
- (b) At a certain section of a duct in which air is flowing at a temperature of 32°C and pressure of 79.95 kN/m^2 with a velocity of 365 m/sec . Assuming isentropic flow determine the velocity and temperature at a section where the pressure is 122.63 kN/m^2 and Mach number at both the sections.
Take $R=287 \text{ Nm/kg}^{\circ}\text{K}$ and K for air=1.4. [10]
8. Write short notes on the following:
- (a) Surface Tension [5]
- (b) Laminar and Turbulent flows [6]
- (c) Aerofoils. [5]
