Unit 1

1. a. A horizontal cylinder of 0.085m diameter is inserted concentrically in a drum of 0.076m internal diameter. Oil is filled in between the gap between cylinder and drum to a length of 0.2m. The torque required to rotate the cylinder in the drum is 4Nm, when the speed of rotation is 7.5rev/s. assuming the end effects to be negligible, calculate the coefficient of viscosity of the oil filled, shear force and power utilized in overcoming resistance?

   b. Determine the absolute pressure in Pascal at a depth of 6m below the free surface of a tank of water, when a barometer reads 760mm mercury (Assume relative density 13.6)?

2. a. Pipeline carrying an oil of specific gravity 0.8 has pressure head of 3m and has a connection of a Mercury manometer connected to it and the readings are measured as shown in the figure.2.10. Find the pressure of the oil flowing in the pipeline and also the pressure head in the left limb?

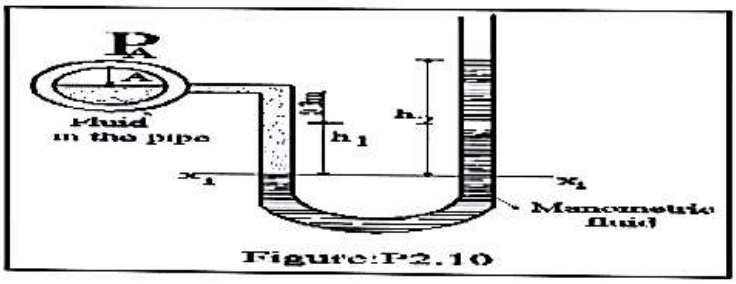

Figure:P2.10

   b. What are the definitions and units for dynamic Viscosity and Kinematic viscosity?

3. a. In a fluid having linear velocity distribution flowing over a flat plate has absolute viscosity 0.064 poise and of specific gravity 0.85, has a velocity of 1.78m/s at a height of 78mm. What is the shear stress at the contact of fluid and surface?
   b Define the following terms along with figure
   i). Atmospheric pressure, ii). Absolute pressure, iii). Gauge pressure and iv). Vaccum pressurs?

4. a. Define surface tension?. Mention the formulae for Liquid droplet, Soap bubble and Liquid jet?

   b. A moving plate having area 0.3m x 0.3m is being pulled with a velocity of 0.55m/s. And the viscosity of the oil is 0.85Ns/m^2. The moving plate is in between two fixed plates which are 15m apart. Calculate the drag force, If the moving plate is placed in between the two fixed plates, If the moving plate is at a distance of 5m from the bottom fixed plate ?

Unit 2

1. a. List out the Characteristics of centre of pressure?
   b. Derive the equation for Total pressure for Inclined plane surface submerged in static fluid?
2. a. What are the values for velocity gradient and shear stress in case of static fluids?
   b. Derive the equation for Centre of pressure for Inclined plane surface submerged in static fluid?
3. a. Derive the equation for Centre of pressure for vertical plane surface submerged in static

fluid?b. What are the definitions for Total pressure and centres of pressure?

4. a. Derive the equation for Total pressure for vertical plane surface submerged in static fluid
b. Write the formulae for total pressure and centre of pressure for horizontal plane surface submerged in static fluid?

Unit 3

1. In a 45 degree bend a rectangular air duct of 1 m2 cross-sectional area is gradually reduced to 0.5 m2 area. If the velocity of flow at 1 m2 section is 10 m/s and pressure is 30 kPa take the specific weight of air as 0.0116 kN/m3. Find the following
   a). magnitude of force required to hold the duct in position?
   b). direction of force required to hold the duct in position?

2. a. Explain the statement of Impulse Momentum equation?
b. Water flows in a circular pipe at one section the diameter is 0.3 metres, the static pressure is 260 kPa gauge, the velocity is 3 m/s and the elevation is 10 metres above ground level. the elevation at a section downstream is 0 m, and the pipe diameter is 0.15 m. find out the gauge pressure the downstream section. assume density of water to be 999 kg/m3?

3. a. Water is flowing through a pipe having diameter 0.35m and 0.2m at the upper end and bottom end having a pressure of 15kPa and 25kPa respectively. Determine the difference in the datum head, if the rate of flow through the pipe is 350lit/sec

b. Explain the statement of Momentum equation

4. a. Write the applications of Momentum equation?

b. Water is flowing through a pipe having diameters 600 mm and 400 mm at the bottom and upper end respectively. the intensity of pressure at the bottom end is 350 kPa and the pressure at the upper end is 100 kPa. determine the difference in datum head if the rate of flow through the pipe is 60 litres/s?

Unit 4... Laminar flow, Turbulent flow and Closed conduit pipes

1. a). Explain in detail about Reynolds experiment with a neat sketch ?
   b). List out the differences between Laminar and Turbulent flow ?
   c). What are the conditions for discharge and loss of head for flow through pipes in series and parallel ?

2. a). Derive the Hagen poisseuille equation for viscous flow flowing through circular pipe ?
   b). List out the various cases comes under Major and Minor Energy Losses and mention the formulae ?

3. List out the formulae for the following and explain each parameter
   i). Hazen williams formula for pipes ii). Dupuits equation iii). Darcy weisbach equation
   iv). Chezys formula v). Reynolds number

4. a). Derive the equation for Average velocity and Drop of pressure for Laminar flow flowing between two parallel plates?
   b). Derive the expression for Darcy weisbach equation of major energy loss ?

5. Define the following terms
   i). Equivalent pipe, ii). Total Energy Line, iii). Hydraulic Gradient Line and iv). Loss of energy or head? v). Major energy loss vi). Minor energy loss vii). Moodys chart viii). Turbulent flow ix). Laminar flow x). Transition flow

Unit 5.....Measurement of flow

1. a). Derive the expression for discharge over a triangular notch ?
   b). Write in detail about classification of orifices ?

2. a). Derive the expression for discharge over a Broad crested weir and find the formulae for maximum discharge ?
   b). What is the expression for discharge over a trapezoidal notch ?

3. List out the formulae for Discharge for the following devices.
   i). Large rectangular orifice ii). Rectangular weir iii). Pitot tube
   iv). Venturimeter v). Orifice meter

4. a. Explain in detail about Hydraulic coefficients ?
   b. Explain the procedure of experimental determination of coefficient of Discharge and coefficient of velocity ?

5. Define the following terms
   i) .Orifice ii). Mouthpiece iii). Notch iv). Weir v). Small orifice
   vi). Large orifice vii). Vena-Contracta viii). Nappe xi). Crest x). Narrow crested weir

6. a. Derive the expression for discharge through large rectangular orifice?
   b. What is the expression for discharge over a stepped notch?

Unit 6.... Boundary layer theory and Forces on submerged bodies

1. List out the formulae for the following and explain the parameters?
   i). Total drag ii). Total lift iii). Momentum thickness
   iv). Energy thickness v). von karmann momentum integral equation

2. Define the following terms
   i). Boundary layer ii). Drag iii). Lift iv). Streamlined body v). Bluff body
   vi). Magnus effect vii). Energy thickness viii). Boundary layer thickness
   ix). Point of separation x). Momentum thickness

3. a. Explain in detail about characteristics of Boundary layer over a flat thin plate with a neat sketch (Laminar boundary layer, Transition boundary layer, Turbulent Boundary layer and Laminar sub-layer) ?
   b. Derive the expression for Energy thickness ?

4. a. What is boundary layer separation and explain the effect of pressure gradient and velocity gradient on the separation of boundary layer with a neat sketch ?
   b. List out the methods to prevent Boundary layer separation?

5. a. Derive the von karmann momentum integral equation for Boundary layer ?
   b. What is the Lift force value on symmetrical objects placed in ideal fluid ?