

GUJARAT TECHNOLOGICAL UNIVERSITY

3rd Semester Civil Engineering – PDDC

Subject Code & Name : X30604 - Advanced Fluid Mechanics

Assignment – 2 (Viscous Flow)

Date : 14-10-2014

Theory :

1. Describe Reynolds's Experiment and discuss.
2. Derive an expression for the velocity distribution for viscous flow through circular pipe. Also sketch the velocity distribution and shear stress distribution across a section of the pipe.
3. Derive the relation for laminar flow between two parallel plates the mean velocity is equal to two-third of the maximum velocity.

Examples :

1. An oil of viscosity 1 poise and specific gravity 0.85 is flowing through a circular pipe of diameter 10 cm at a rate of 6 litre/s.
Calculate i). Pressure drop in a length of 400 m
ii). Shear stress at the pipe wall.
2. Oil of specific gravity 0.82 is pumped through a horizontal pipe line 15 cm in diameter and 3 km long at the rate of 900 litres per minute. Pump has efficiency of 68% and requires 7.35kw to pump the oil. Determine the dynamic viscosity of oil and verify whether the flow is laminar or not.
3. Calculate the rate of flow of oil ($\mu=0.8$ poise) flowing between two fixed plates kept at a distance of 20 mm apart. The drop of pressure in a length of 4 m is 4×10^4 N/m². The width of the plates is 150mm.