UNIT III FLOW THROUGH PIPES

PART – A

1. What do you mean by viscous flow?
2. What is Hagen Poisuille's formula?
3. Define Kinetic energy correction factor?
4. Define momentum correction factor?
5. Define hydraulic gradient line.
6. Define the major energy loss and minor energy loss.
7. Define water hammer in pipes.
8. Define incompressible flow.
9. Write down the examples of laminar flow/viscous flow.
10. What are the characteristics of laminar flow?
11. Write down chezy's formula.
12. Write down the formula for finding the head loss due to entrance of pipe h_i?
13. Write down the formula for efficiency of power transmission through pipes?
14. Give an expression for loss of head due to sudden enlargement of the pipes.
15. Give an expression for momentum integral equation of the boundary layer?
16. Differentiate between steady flow and uniform flow.
17. A crude of oil of kinematic viscosity of 0.4 stoke is flowing through a pipe of diameter 300mm at the rate of 300 liters/sec.Find the head lost due to friction for a length of 50m of the pipe.
18. Find the type of flow of an oil of relative density 0.9 and dynamic viscosity 20 poise, flowing through a pipe of diameter 20 cm and giving a discharge of 10lps.
19. Give an expression for co efficient of friction in terms of shear stress.
20. Give an expression for loss of head due to sudden contraction.
21. Give an expression for loss of head at the entrance of the pipes.
22. Derive an expression for drop of pressure for a given length of a pipe.
23. Define Darcy formula.
24. What are the factors influencing the frictional loss in pipe flow.
25. Give the formula average velocity.
26. Give the formula for velocity distribution.
27. What are the factors to the determined when viscous fluid flows through the circular pipe?

PART - B

1. Find the head lost due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3 m/s using (i) Darcy formula, (ii) Chezy's formula for which C = 60.
2. An oil of sp.Gr 0.9 and viscosity 0.06 poise is flowing through a pipe of diameter 200 mm at the rate of 60 litres/sec./ find the head lost due to friction for a 500 m length of pipe. Find the power required to maintain this flow.
3. The rate of flow of water through a horizontal pipe is 0.25 m^3/s. The diameter of the pipe

which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller is 11.772 N/cm^2. Determine: (i) loss of head due to sudden enlargement, (ii) pressure intensity in the large pipe, (iii) power lost due to enlargement.

4. A horizontal pipe line 40 m long is connected to a water tank at one end discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank

pipe is 150 mm diameter and its diameter is suddenly enlarged to 300 mm. The height of water level in the tank is 8 m above the centre of the pipe. Considering all losses of head which occur, determine the rate of flow. Take f = 0.01 for both sections of the pipe.

5. A pipe line, 300 mm in diameter and 3200 m long is used to pump up 50 kg per second of oil whose density is 950 kg/m^3 and whose kinematic viscosity is 2.1 stokes. The centre of the pipe line at the upper end is 40 m above than that at the lower end. The discharge at the upper end is atmospheric. Find the pressure at the lower end and draw the hydraulic gradient and the total energy line.
6. A siphon of diameter 200 mm connects two reservoirs having a difference in elevation of 15 m. The total length of the siphon is 600 mm and the summit is 4 m above the water level in the upper reservoir. If the separation takes place at 2.8 m of water absolute, find the maximum length of siphon from upper reservoir to the summit. Take f = 0.004 and atmospheric pressure = 10.3 m of water.
7. The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300 m, 170 m and 210 m and of diameters 300 mm, 200 mm and 400 mm respectively, is 12m. Determine the rate of flow of water if co – efficient of friction are 0.005, 0.0052 and 0.0048 respectively, considering: (i) minor losses also (ii) neglecting minor losses.
8. A main pipe is divided into two parallel pipes which again forms one pipe. The length and diameter for the first parallel pipe are 2000 m and 1.0 m respectively, while the length and diameter of 2nd parallel pipe are 2000 m and 0.8 m. Find the rate of flow in each parallel pipe, if total flow in the main is 3 m^3/s. The co efficient of friction for each parallel pipe is same and equal to 0.005.
9. A pipe of diameter 20 cm and length 2000 m is connects two reservoirs, having difference of water levels as 20 m. determine the discharge through the pipe.

   If an additional pipe of diameter 20 cm and length 1200 m is attached to the last 1200 m length of the existing pipe, find the increase in the discharge. Take f = 0.015 and neglect minor losses.

10. A pipe line 60 cm diameter bifurcates at a Y- junction into two branches 40 cm and 30 cm in diameter. If the rate of flow in the main pipe is 1.5 m^3/s and mean velocity of flow in 30 cm diameter pipe is 7.5 m/s, determine the rate of flow in the 40 cm diameter pipe.
11. A pipe line of length 2000 m is used for power transmission. If 110.3625 kW power is to be transmitted through the pipe in which water having a pressure of 490.5 N/cm^2 at inlet is flowing. Find the diameter of the pipe and efficiency of transmission if the pressure drop over the length of pipe is 98.1 N/ cm^2. Take f = 0.0065.

Find the maximum power transmitted by a jet of water discharging freely out of nozzle fitted to a pie = 300 m long and 100 mm diameter with co efficient of friction as 0.01. the available head at the nozzle is 90 m.