

(Time: 3 HRS)

(Total Marks 80)

G.P. 10099945

- Note: - 1. Q.No.1 is compulsory.  
2. Attempt **any three** questions out of remaining five questions.  
3. Assume any data if required stating clearly

- Q.No.1 (a) Enlist the various types of major and minor losses. [5]  
(b) What do you mean by repeating variables? How they are selected for dimensional analysis. [5]  
(c) Write a short note on laminar flow. [5]  
(d) Explain the different types of dimensionless numbers. [5]  
(e) Explain the moment of momentum principal. [5]
- Q.No.2 (a) Derive an expression for diameter of Nozzle for Maximum Transmission of power Through Nozzle. [10]  
(b) The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300m, 170 m and 210 m and of diameter 300 mm, 200 mm and 400 mm respectively. is 12 m. Determine the rate of flow of water if coefficient of friction is 0.005, 0.0052 and 0.0048 respectively, considering 1. Minor losses 2. Neglecting Minor losses. [10]
- Q.No.3 (a) Explain different steps in solving distribution network by Hardy Cross method. [10]  
(b) A syphon of diameter 200 mm connects two reservoirs having a difference in elevation of 20 m. The length of the syphon is 500 m and summit is 3.0 m above the water level in the upper reservoir. The length of the pipe from upper reservoir to the summit is 100 m. Determine the discharge through the syphon and also pressure at the summit. Neglect minor losses. The coefficient of friction,  $f = 0.005$ . [10]
- Q.No.4 (a) Explain Prandtl's mixing length theory. [10]  
(b) A smooth pipe of diameter 400mm and length 800 m carries water at the rate of  $0.04 \text{ m}^3/\text{s}$ . Determine the head lost due to friction, wall shear stress. Take the kinematic viscosity of water 0.018 stokes. [10]
- Q.No.5 (a) A lawn sprinkler with two nozzles of diameter 4 mm each is connected across a tap of water. The nozzles are at a distance of 30 cm and 20 cm from the Centre of the tap. The rate of flow of water through tap is  $120 \text{ cm}^3/\text{s}$ . The nozzles discharge water in the downward direction. Determine the angular speed at which the sprinkler will rotate free. [10]

(b) A pipe of diameter 1.5 m is required to transport an oil of specific gravity [10]  
0.90 and viscosity  $3 \times 10^2$  poise at the rate of 3000 litre/s. Test were  
conducted on a 15 cm diameter pipe using water at 20 degree C. Find the  
velocity and rate of flow in the model. Viscosity of water at 20 degree C =  
0.01 poise.

- Q.No.6. (a) An oil of viscosity  $0.1 \text{ Ns/m}^2$  and relative density 0.9 is flowing through [5]  
a circular pipe of diameter 50 mm and of length 300 m. The rate of flow of  
fluid through the pipe is 3.5 liters /s. Find the pressure drop in a length of  
300 m and also the shear stress at the pipe wall.
- (b) Explain the water hammer in pipes. [5]

\*\*\*\*\*