

Duration: 3 Hours

Total Marks:80

- N. B.:**
- (1) Question No. 1 is compulsory.
 - (2) Attempt any three questions from remaining five questions.
 - (3) Assume suitable data if necessary.

Q. 1 Answer any five questions (20)

- a) Determine the mass flow rate, mass velocity and the volumetric flow rate of the fluid flowing in a pipe of 40 mm inside diameter, velocity of the water flowing through the pipe is 0.5 m/s, and the density of water is 1000 kg/m^3 .
- b) Define Mach no.? Explain and give its significance.
- c) Explain centrifugal pump in brief.
- d) Describe different properties of fluids.
- e) What are the different types of losses occurring in the pipe, how these can be calculated.
- f) Explain Priming and Cavitation.

Q. 2

- (a) An inverted U-tube manometer is connected to two horizontal pipes A and B through which water is flowing. The vertical distance between the axes of these pipes is 30 cm. when an oil of specific gravity 0.8 is used as a gauge fluid, the vertical heights of water columns in the two limbs of the inverted manometer (when measured from the respective centre lines of the pipes) are found to be same and equal to 35 cm. determine the difference of pressure between the pipes. (10)
- (b) A 40 cm diameter pipe, conveying water, branches into two pipes of diameter 30 cm and 20 cm respectively. If the average velocity in the 40 cm diameter pipe is 3 m/sec, find the discharge in this pipe. Also determine the velocity in 20 cm diameter pipe if the average velocity in 30 cm diameter pipe is 2 m/sec. (10)

Q. 3

- (a) Explain the construction and working of reciprocating pump. (10)
- (b) An oil of specific gravity 0.7 is flowing through the pipe of diameter 300 mm at the rate of 500 lit/sec. Find the head lost due to friction and power required to maintain the flow for a length of 1000 m. Take kinematic viscosity as 0.29 stokes. (10)

Q. 4

- (a) Derive an expression for the velocity distribution, shear stress distribution, relation between average velocity and maximum velocity, volumetric flow rate, pressure drop for the laminar flow or viscous flow of fluid through the pipe. (10)
- (b) Find the pressure drop due to friction in a 60 m long pipe of 25 cm internal diameter when water is flowing with a rate of 3 kg/s. Calculate the new flow in kg/s if the pressure drop falls by 1/3, take $\mu = 0.008$ poise. (10)

Q. 5

- (a) Explain any two types of valves in details with their applications. (10)
- (b) Find the Mach number when an aeroplane is flying at 1100 km/hr through still air having a pressure of 7 N/cm^2 and temperature -5°C , wind velocity may be taken as zero. Take $R = 287.14 \text{ J/kg. K}$. Calculate the pressure temperature and density of air at stagnation point on the nose of the plane. Take $\gamma = 1.4$ (10)

Q. 6

- (a) Explain different types of impeller. (08)
- (b) Explain NPSH and how it can be calculated. (06)
- (c) What are the stagnation properties? Explain with the help of formulae. (06)