

(03 Hours)

[Total Marks: 80]

- N. B.: (1) Question No. 1 is Compulsory.
- (2) Attempt any Three questions out of remaining five questions.
- (3) Figures to the right indicate full marks.
- (4) Make suitable assumptions wherever necessary.

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1. Answer the following sub questions (Any Four) [20]
- (a) Differentiate between 'U' tube manometer and inclined tube manometer.
- (b) Discuss the effect of roughness parameter on Friction Factor
- (c) Explain the following-
NPSH, Cavitation, Priming
- (d) What is the significance of Mach No.? Also define Mach No.
- (e) Give the typical proportions of tank and impeller dimensions of a standard stirred tank.
2. (a) A pressure gauge consists of two cylindrical bulbs B and C each of 15 sq. cm cross-sectional area, which are connected by a U-tube with vertical limbs each of 0.3 sq. cm cross-sectional area. A red liquid of specific gravity 0.94 is filled into C and clear water is filled into B, the surface of separation being in the limb attached to C. Find the displacement of the surface of separation when the pressure on the surface in C is greater than that in B by an amount to 1 cm head of water. [10]
- (b) a) Explain the Rheological behavior of Newtonian and Non-Newtonian fluids?
b) Write note on Inverted U-tube Differential Manometers. [10]
3. (a) A venturimeter is to be installed in a 100 mm line to measure the flow of water. The maximum flow rate is expected to be $73.8 \text{ m}^3/\text{hr}$. The 1.27 m manometer used to measure the differential pressure is to be filled with mercury and water is to fill the leads about the mercury surfaces.

[Turn Over]

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What throat diameter should be specified for the venture and what will be the power required to operate the meter at full load? $C_d=0.98$ [10]

- (b) Derive an expression for Modified Bernoulli's Theorem from Eulers equation of motion. [10]
4. (a) For the laminar flow of the fluid through a circular pipe, derive an expression for the average Velocity, maximum velocity and also show the velocity profile. [10]
- (b) In a vertical pipe conveying water, pressure gauges are inserted at A and B where the diameters are 15 cm and 7.5 cm, respectively. The point B is 2.4 m below A and when the rate of flow down the pipe is $0.02 \text{ m}^3/\text{sec}$, the pressure at B is 0.12 Kgf/cm^2 greater than at A. Assuming that the losses in the pipe between A and B can be expressed as $KV_A^2/2g$ where V_A is the velocity at A. Find the value of K. [10]
5. (a) A supersonic plane flies at 1900 Km/hr in air having a pressure of 28.5 KPa(abs) and density of 0.439 kg/m^3 . Calculate the temperature, Pressure, Density of air at stagnation point on the nose of plane for adiabatic. Take $R=287 \text{ Nm/Kg K}$ and $K = 1.4$ [10]
- (b) Write short note on-1. Capillary Viscometer 2. Power curves in agitator [10]
6. (a) Find the rise in pressure in the impeller of a centrifugal pump through which water is flowing at a rate of $0.015 \text{ m}^3/\text{s}$. The internal and external diameters of the impeller are 17 cm and 35 cm. The widths of the impeller at inlet and outlet are 1.4 cm and 0.8 cm. The pump is running at 1500 rpm. The water enters the impeller radially at inlet and impeller vane angle at outlet is 45° . Neglect losses through the impeller. [10]
- (b) Explain the working and principle of following valves with its diagram- Globe valves, Check valves, Gate valves, butterfly valves and non-return valves. [10]