17426

15116

3 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answer with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. a) **Attempt any SIX of the following:** **12**

(i) Define kinematic viscosity and write its SI units.

(ii) Define compressible and incompressible fluids.

(iii) Explain significance of Reynold's number.

(iv) State relation between fanning friction factor and Reynold's number for laminar and turbulent flow patterns.

(v) Name any four pipe fittings.

(vi) Name the pump used for viscous fluids.

(vii) Name any two vacuum generating equipments.

b) **Attempt any TWO of the following:** **08**

(i) Derive equation of continuity.

(ii) Draw neat sketch of:

(i) Diaphragm valve

(ii) Gate valve

(iii) What is air binding? Why priming is required for centrifugal pump.

Marks

2. Attempt any FOUR of the following: **16**

a) Draw a neat labelled diagram of inclined single column manometer and explain its working.

b) Give the expression to calculate velocity distribution for flow of viscous fluid through circular pipe showing the schematic diagram of distribution from maximum to minimum value.

c) Explain working of rupture disc.

d) Define NPSH and derive equation of NPSH for system with suction lift.

e) Explain the frictional loss due to sudden contraction and give formula for calculating the losses.

f) Explain construction of venturimeter with neat labelled diagram.

3. Attempt any FOUR of the following: **16**

a) For a U-tube manometer derive.
$P = (\rho_2 g h_2 - \rho_1 g h_1)$
Where, h_1 = height of light liquid above datum line
h_2 = height of heavy liquid above datum line.
ρ_1 = density of light liquid.
ρ_2 = density of heavy liquid.

b) Draw a neat sketch of non-return valve? Give its uses.

c) Explain the factors which influences the choice of pumps. (any four)

d) Define Non-Newtonian fluid and explain the common types of Non-Newtonian fluid.

e) Explain the use of fan as a pumping device.

f) A liquid of density 1150 kg/m^3 is flowing from point A to point B, which is 5 m above point A. The frictional losses in a pipeline of internal diameter 40 mm are 1 J/kg for a volumetric rate of 500 cm^3/sec. If points A and B, are at the atmospheric pressure and the velocity at pt. A is zero, calculate the pump work done.

Marks

4. Attempt any FOUR of the following: **16**

a) Draw neat diagram and state the application of:

(i) Socket

(ii) Elbow

b) Find type of flow an oil of specific gravity (S=0.9) and dynamic viscosity 20 poise, flowing through a pipe of diameter 20 cm and giving discharge of 10 litres/sec.

c) Differentiate between reciprocating compressor and centrifugal compressor (4 points)

d) Explain construction of Pitot tube with labelled diagram.

e) Find loss of head when a pipe of diameter 200 mm is suddenly enlarged to a diameter of 400 mm. The rate of flow water through pipe is 250 lit/sec.

f) A U tube manometer is used to measure the pressure of oil, having specific gravity of 0.80, flowing through a pipeline. The right arm is open to atmosphere and the left arm of manometer is connected to the pipeline. The centre of the pipe is 90 mm below the level of mercury in the right arm. If the difference in mercury level in the two arms is 150 mm, find the pressure of oil in the pipeline.
ρ water = 1000 kg/m^3
ρ mercury = 13600 kg/m^3

5. Attempt any TWO of the following: **16**

a) A crude oil of viscosity 0.97 poise and specific gravity 0.9 is flowing through a horizontal circular pipe of diameter 100 mm and of length 10 m. Calculate the difference of pressure at the two ends of the pipe. If 100 kg of oil is collected in a tank in 30 seconds.

b) A 30 cm diameter pipe, conveying water, branches in two pipes of diameter 20 cm and 15 cm respectively. If average velocity in 30 cm diameter pipe is 2.5 m/sec. Find discharge in this pipe. Also determine velocity in 15 cm pipe, if average velocity in 20 cm diameter pipe is 2 m/sec.

Marks

c) Sulfuric acid is flowing through a pipe of 50 mm internal diameter. A thin orifice of 10 mm diameter is fitted in the pipe and the differential pressure shown by a mercury manometer is 10 cm. Assume column of manometer are filled by acids.
Calculate:

(i) mass flowrate of acid in kg/sec.

(ii) approximate loss of pressure in kN/m^2.

if coefficient of orificemeter = 0.63

6. Attempt any TWO of the following: **16**

a) Describe with neat diagram, working of a gear pump.

b) A pipe of diameter 400 mm carries water at a velocity of 25 m/sec. The pressure at two points 1 and 2 are given as 29.43 N/cm^2 and 22.563 N/cm^2 respectively. While datum head at point 1 and point 2 are 28 m and 30 m. Find loss of head between point 1 and 2.

c) Explain with neat diagram, working of steam jet ejector.