

(3 Hours)

Max. Marks: 80



- 1) Question No 1 is compulsory.
- 2) Attempt any three out of remaining five questions.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if required.

- Q.1 a Write a short note on (Any Five) 20
- a) Define i) Dynamic viscosity and ii) Kinematic viscosity
 - b) Define i) Centre of buoyancy and ii) Metacentric height
 - c) Define i) Steady and Unsteady flow ii) Laminar and Turbulent flow
 - d) Define Major and Minor energy losses
 - e) Enlist the properties of hydraulic fluid.
 - f) State different types of accumulator and explain one of them with neat sketch.
 - g) Explain the pressure relief valve with neat sketch
- Q.2 a State Newton's law of viscosity and give example of its application. 04
- b Describe in detail Meter-in, Meter-out and bleed-off circuit with neat sketches 10
- c A large tank of sea water has a door in the side 1 m square. The top of the door is 5 m below the free surface. The door is hinged on the bottom edge. Calculate the total pressure force and centre of pressure. The density of the sea water is 1033 kg/m^3 . 06
- Q.3 a Derive Bernoulli's equation and state the assumptions made. 07
- b Explain the principle of operation and working of regenerative hydraulic circuit with neat sketch. 06
- c A venturimeter has its axis vertical, the inlet & throat diameter being 150 mm & 75 mm respectively. The throat is 225 mm above inlet and $C_d = 0.96$. Petrol of specific gravity 0.78 flows up through the meter at a rate of $0.029 \text{ m}^3/\text{sec}$. Find the pressure difference between the inlet and throat. 07
- Q.4 a What are the advantages and disadvantages of hydraulic system? 04
- b Explain the working of the valves given below with neat sketches. 08
- i. Pressure reducing valve
 - ii. Sequence valve
- c Oil of viscosity 8 Poise and specific gravity 1.2 flows through a horizontal pipe 80 mm in diameter. If the pressure drop in 100 m length of the pipe is 1500 kN/m^2 , determine, 08
1. Rate of flow of oil.
 2. The maximum velocity
 3. The velocity and shear stress at 10 mm from the wall

- Q.5 a Explain with neat sketch 4/3 Direction Control valve. 04
b Derive Hagen-Poiseuille equation for laminar flow through circular pipe. 08
c A pipe of diameter 20 cm and length 2000 m connects two reservoirs, having 08
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 the minor losses
- Q.6 a Write ISO symbol for following (Any Four) 08
i. Flow control valve
ii. Bidirectional variable displacement motor
iii. Pressure switch
iv. Pressure relief valve
v. Fixed displacement hydraulic pump
vi. Double acting cylinder
- b Classify different types of pumps used in hydraulic circuit. Explain the 06
working of vane pump with neat sketch.
- c A shaft of 20 mm and mass 15 kg slides vertically in a sleeve with a velocity 06
of 5 m/s. The gap between the shaft and the sleeve is 0.1 mm and is filled
with oil. Calculate the viscosity of oil if the length of the shaft is 500 mm.
