

PROD / III / CBGS / EM & FP / 18-05-2017

fluid Mechanics & fluid power Q.P. Code : 559101



(3 Hours)

[Total Marks : 80

- N.B. : (1) Question No. 1 is **compulsory**.
(2) Solve **any THREE** questions from remaining **FIVE** questions.
(3) **Assume** suitable data if required.
(4) Assumptions made should be clearly stated.

1. a) A mercury column is used to measure the atmospheric pressure. The height of column above the mercury well surface is 762 mm. The tube is 3 mm in diameter. The contact angle is 140° . Determine the pressure in mm of mercury if surface tension is 0.51 N/m. The space above the column may be considered as vacuum. 5
- b) An inverted differential manometer containing oil of specific gravity 0.9 is connected to find the pressure difference at two points of a horizontal pipe containing water. If the manometer reading is 40 cm, find the difference of pressures at two points of a pipe in KPa. 5
- c) Explain with neat sketch the working of pressure relief valve. 5
- d) Write short note on Navier Stokes equations for steady incompressible fluid in Cartesian Co-ordinate system. 5
2. a) A shaft of 145 mm diameter runs in journals with a uniform oil film thickness of 0.5 mm. Two bearings of 20 cm width are used. The viscosity of the oil is 19 cP. Determine the speed if the power absorbed is 15Watts. 10
- b) Explain with neat sketch the operation of balanced vane pump. How hydraulic balancing is achieved in the pump? Draw the performance characteristic of the pump. 10
3. a) A horizontal venturimeter with inlet and throat diameters 300 mm and 100 mm respectively is used to measure the flow of water. The pressure intensity at inlet is 130 KN/m^2 while the vacuum pressure head at the throat is 350 mm of mercury. Assuming that 3% of head is lost in between the inlet and throat, find 10
- i) The value of coefficient of discharge.
ii) Rate of flow.
- b) Explain the working of the valves given below with neat sketch and their applications in hydraulic circuit. 10
- i) Sequence valve ii) Unloading valve

[TURN OVER]

4. a) A sliding gate 3 m wide and 1.5 m high situated in a vertical plane has a coefficient of friction, between itself and guide of 0.20. If the gate weighs 18 KN and if its upper edge is at a depth of 9 m, what vertical force is required to raise it? Neglect buoyancy force on gate. 10
- b) What are the advantages and disadvantages of hydraulic system? Why oil is used in hydraulic system instead of water? Enlist the desirable properties of hydraulic fluid. 10
5. a) Two pipes of 20 cm and 30 cm diameter are laid in parallel to pass a total discharge of 100 lit/sec. Each pipe is 250 m long. Determine discharge through each pipe. Now these pipes are connected in series to connect two tanks 500 m apart to carry same total discharge. Determine water level difference between the tanks. Neglect minor losses in both cases. Take friction factor $F = 0.02$ for both pipes. 10
- b) Explain with neat sketch the operation of Regenerative circuit. Derive the relationship between extend and retract speed and thrust in terms of piston area and rod area and prove that they are equal for 2:1 cylinder. 10
6. a) State and derive Bernoulli's equation. List the assumptions made also. 8
- b) Explain with neat sketch, working of the most efficient hydraulic circuit out of;
- i) Meter-in ii) Meter-out iii) Bleed-off 4
- c) A crude oil of viscosity 0.9 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 120 mm and length 12 m. Calculate the difference of pressure at two ends of pipe if 785 N of oil is collected in a tank in 25 sec. 4
- d) Give the ISO symbols for the following (Any FOUR) 4
- i) Bidirectional variable displacement motor.
- ii) Pressure switch.
- iii) Pressure reducing valve.
- iv) Pressure and temperature compensated flow control valve.
- v) Two position four way solenoid operated valve.
- vi) Double acting cylinder with variable cushion at both ends.