3281

October 2024

Time – Three hours
(Maximum Marks: 100)

[N.B.   1.   Answer all questions under Part-A. Each question carries 3 marks.

2.   Answer all the questions either (A) or (B) in Part-B. Each question carries 14 marks.]

PART – A

1.   Define specific weight and give its units.

2.   Define absolute pressure. How absolute pressure is measured?

3.   State rotational and irrotational flow.

4.   List any three minor losses in flow through pipes.

5.   What is draft tube?

6.   What are the functions of air vessel?

7.   List out the major elements of pneumatic system.

8.   What are the functions of accumulator?

9.   What is the use of quick exhaust valve?

10.   Draw the ISO symbol for FRL unit.

PART – B

11.   (a)   (i)   State and prove Pascal's Law. (10)

   (ii)   If the density of liquid is 940 kg/m³, find its specific weight, specific volume and relative density. (4)

(Or)

   (b)   (i)   A vacuum pressure in a pipe line carrying water is measured by U tube manometer, the deflection of mercury between the lines was 0.05 m and the free surface of mercury in the open limb was 0.15 m below the centre line of the pipe. Find the pressure in the pipe in absolute unit in terms of 'm' of water. (7)

   (ii)   A rectangular plate 3m long and 1.4m wide is immersed vertically in water in such a way that its 3m side is parallel to the water surface and is 1.4 m below it. Determine: (i) Total pressure on the plate (ii) Position of centre of pressure. (7)

[Turn over.....

12. (a) (i) Explain the construction and working principle of Venturimeter with a neat sketch. (9)

   (ii) Write the working principle of Pitot tube. (5)

   (Or)

   (b) (i) Two reservoirs are connected by a 50 mm diameter and 2 km long pipe line. The difference of water level between the two reservoirs is 20 m. Calculate the discharge. Take friction factor = 0.0248 (6)

   (ii) A hydraulic turbine is supplied with 0.3 m³/s of water through horizontal pipe of 250 m long and 300 mm in diameter. Determine the power supplied to the turbine, if the pressure of water at the entrance is 600 kN/m². Take F= 0.032 (8)

13. (a) Explain the construction and working principle of single stage centrifugal pump with neat sketch.

   (Or)

   (b) Double acting reciprocating pump having a piston area of 0.1 m² and stroke of 300 mm. The pump discharges 0.04 m³/s when the pump is running at 45 rpm through a total height of 10 m. Find (i) Theoretical Discharge (ii) Power required to drive the pump (iii) Coefficient of discharge.

14. (a) (i) Explain the construction and working principle of external gear pump with a neat sketch. (7)

   (ii) Explain the construction and working principle of poppet valve in hydraulic system with a neat sketch. (7)

   (Or)

   (b) Draw and explain the sequencing circuit for the operation of double acting cylinder in hydraulic system.

15. (a) (i) Explain the construction and working of 5/2 DCV in pneumatic system with a neat sketch. (7)

   (ii) Explain the construction and working of shuttle valve with a neat sketch. (7)

   (Or)

   (b) Draw and explain the operation of double acting cylinder using speed control in pneumatic circuit.