

HYDRAULICS & PNEUMATICS

Time: 3 hours

Max. Marks: 100

Note: Answer any six from part – A and any seven from part – B

Solve the problem in SI units only

PART – A

1. Explain difference between simple manometer and differential manometer. 5
2. List the different application of Bernoulli's theorem. 5
3. Define the following: 5
 - I. Compressible fluid
 - II. Incompressible fluid.
4. Define hydraulic turbine and classify the hydraulic turbines. 5
5. Example with line diagram, the working principle of reciprocating pump. 5
6. Write functions of control vales. 5
7. Describe accumulator with neat sketch. 5
8. List the component of pneumatic system. 5
9. Explain the general layout of pneumatic system. 5

PART – B

10. (a) Explain the phenomenon of capillary tube. 4
(b) Explain with a neat figure U – tube differential manometer. 6
11. (a) Write any three differences between simple manometer and differential manometer. 3
(b) Explain with a neat sketch the working of bourbon's tube pressure gauges. 7
12. (a) Explain the following : 4
 - I. Rotation & Irrotational flow.
 - II. Laminar and Turbulent flow.

- (b) The water is flowing through the pipe having diameters 200 mm and 100 mm at the cross-section 1 and 2 respectively. The velocity of water at section 1 is 4 m/s. Find the discharge at section 1 and also find the velocity at section 2. 6
13. (a) Draw a neat figure of orifice meter and mention the parts. 3
 (b) A venturimeter has an area of 9 to 1, the larger diameter being 300. During the flow the recorded pressure head in the large diameter is 6.5 m and at throat is 4.25 m. If the coefficient of discharge is 0.99. Calculate discharge. 7
14. (a) Define the following : 4
 I. Hydraulic gradient line
 II. Total energy line
 (b) A pipe of 300 m long with a diameter of 0.3 m is supplying water. Calculate the discharge of through the pipe the loss of head due to friction is 1.5 m. Take Darcy's coefficient as 0.01. 6
15. (a) Write any three differences between Impulse turbine and Reaction turbine. 3
 (b) Explain working principle of centrifugal pump with neat figure. 7
16. Two jets strike the buckets of a Pelton wheel which is having shaft power as 15450 kW. The diameter of each jet is given as 200 mm. If the net head on the turbine is 400 m. Find the overall efficiency of the turbine, take $C_v = 1.0$. 10
17. (a) Write any four advantages and disadvantages of Hydraulic systems. 4
 (b) Explain lobe pump with neat sketch. 6
18. (a) Write any four functions of control valves. 4
 (b) With the neat sketch, explain working principle of gate valve. 6
19. (a) State Pascal's law and explain one application with neat sketch. 5
 (b) Explain with neat sketch, the double-acting cylinder. 5
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PART – A

1. Define the following terms: 5
 - I. Density
 - II. Specific weight
 - III. Viscosity
2. Define atmospheric pressure, gauge pressure & absolute pressure. Write the relation between them. 5
3. State Bernoulli's theorem and mention the assumptions made. 5
4. Explain Hydraulic gradient line and total gradient line. 5
5. Define a turbine and classify them. 5
6. Explain priming of pumps. 5
7. Draw the Block diagram of pneumatic system and label the parts. 5
8. Explain hydraulic spring loaded accumulator. 5
9. List the advantages of hydraulic system. 5

PART – B

10. (a) Explain surface tension. 5
(b) Explain simple manometer. 5
11. (a) State the equation of continuity of flow. 4
(b) A horizontal venturimeter has inlet and throat diameters of 300mm and 150mm respectively is used to measure the flow of water. The reading of differential mercury manometer is 200mm. Determine the rate of flow in lit/sec, take $C = 0.98$ 6

12. (a) Explain total energy of a Liquid particle. 4
- (b) A horizontal pipe having diameters 200mm and 100mm at sections (1) and (2) respectively. If the velocity of water at section (1) is 4 m/s. Find at section (2) 6
- I. Velocity of water
 - II. Velocity head
 - III. Discharge
13. (a) State Chezy's equation. 4
- (b) Find the maximum power transmitted by a pipe to a power station of 3kms long and 200mm diameter. The pressure of water in power station is 1500kPa and $t = 0.01$. 6
14. A Pelton wheel develops 13000kW at 430rpm. If the overall efficiency is 85% at a head of 100mm. Deter the following: 10
- I. Discharge
 - II. Dia. of wheel
 - III. Dia. of jet
 - IV. No. of buckets
 - V. Width & depth of buckets
- Assume $v = 0.46 V$
Coefficient of discharge = $C_v = 0.98$
15. (a) Explain slip and Negative slip. 4
- (b) A double acting reciprocating pump of stroke 300mm and piston diameter is 150mm. Pre delivery and suction head of 26m and 4m respectively. If the pump runs at 60rpm. Find the power required to drive the pump with efficiency 60%. 6
16. (a) Sketch and explain gear pump. 5
- (b) Explain $\frac{5}{2}$ DC valve & its uses. 5
17. (a) List the areas of applications of hydraulic system. 5
- (b) Write the symbols for the hydraulic components. 5
- I. Double acting cylinder
 - II. 4/2 DC valve
 - III. Check valve with spring
 - IV. Spring loaded accumulator
 - V. Fixed displacement unidirectional pump
18. (a) Explain lubricator. 5
- (b) Explain double acting cylinder working. 5
19. (a) Define an air motor and mention types. 5
- (b) Explain non-return or check valve. 5