

**PSG POLYTECHNIC COLLEGE, COIMBATORE - 641 004**  
**M12303/D12303 HYDRAULICS AND HYDRAULIC MACHINES**

**Model Question Paper**

**Time: 3 Hours**

**Max. Marks: 100**

**Instructions:**

1. **Group A** and **Group B** questions should be answered in the Main Answer book.
2. Answer any **TEN** questions in **Group A**. Each question carries three marks.
3. Answer **ALL** questions either **(a)** subdivision or **(b)** subdivision in **Group B**. Each question carries 14 marks.

**Group – A**

**Marks: 10 x 3 = 30**

1. Define the following terms: (i) Surface tension (ii) viscosity
2. State Pascal's Law
3. What are the classifications of manometers? State the difference between them.
4. Discuss uniform flow.
5. State the applications of Bernoulli's theorem.
6. Describe the vena contracta.
7. Define wetted perimeter.
8. What is syphon? Where it is used?
9. State the laws of fluid friction pertaining to laminar flow.
10. Explain the function of hydraulic brake in Peloton turbine
11. What is draft tube? Mention the functions of the same.
12. Why priming is important in centrifugal pumps?
13. What is an airvessel? What are the functions of air vessel in suction and delivery sides in a reciprocating piston pump?
14. Mention the elements of hydraulic system.
15. Draw the ISO symbol of solenoid control.

**Group– B**

**Marks: 5 x 14 = 70**

16. a) [i] Explain the working of a hydraulic jack with a neat sketch. (7)  
[ii] A gauge records a pressure of 24.52 kN/m<sup>2</sup> vacuum. Compute the corresponding absolute Pressure in (i) kN/m<sup>2</sup> and (ii) meters of water. The local atmospheric Pressure is 0.75m of mercury. Specific gravity of mercury is 13.6. (7)  
(OR)
- b) [i] Classify manometers. Why mercury is preferred as manometer liquid? (7)  
[ii] An U-tube differential manometer connects two pressure pipes A and B. The pipe A Contains carbon tetra-chloride having a specific gravity of 1.594 under a pressure of 120 kN/m<sup>2</sup>. The pipe B contains oil of specific gravity of 0.8 under a Pressure of 220kN/m<sup>2</sup>. The pipe lies 3m above pipe B. The centre of the pipe B is at the level of mercury in the limb which connects the pipe A .Find the difference in the level of mercury. (7)

17. a) (i) State the difference between laminar and turbulent flow. Give the characteristics of laminar and turbulent flow. (7)
- (ii) Calculate the flow of water in liters/hour through a 40cm x 15cm venturimeter when the differential gauge connected to the mouth and throat is 25cm of mercury, assuming the coefficient of the meter as 0.98. (7)

(OR)

- b) (i) What is vena-contracta? How the velocity of flow through an orifice is determined. (7)
- (ii) In an experiment on determination of hydraulic co-efficient of a 30mm diameter sharp edged orifice, it was found that the jet issuing horizontally under a head of 1.2m travelled a horizontal distance of 1.8m from vena contracta in course of a vertical drop of 0.73m from the same point. The actual discharge is 0.002 m<sup>3</sup>/sec. Calculate Cd, Cv and Cc. (7)
18. a) (i) Explain hydraulic gradient line and total gradient line. (7)
- (ii) Using Chezy's formula,  $v=c \times \sqrt{m.i}$ , determine the head lost due to friction in a pipe of 80mm diameter and length 35m. The velocity of flow is 2m/s. Take chezy Constant=100. (7)

(OR)

- b) (i) Derive an expression for power transmission through pipes. What is the condition for maximum power to be transmitted through pipes? (7)
- (ii) A pipe line 10km long delivers a power of 50kw at its outlet end. The pressure is 4500kN/m<sup>2</sup> at inlet and pressure drop per km of the pipe is 50 kN/m<sup>2</sup>. Assuming  $F=0.025$ . Determine the diameter of the pipe and the efficiency of transmission. (7)
19. a) (i) What is the purpose of draft tube in a reaction turbine? Why does a pelton wheel not possess a draft tube? (7)
- (ii) Explain briefly the working principle of a reaction turbine with the help of illustrative free hand line sketches. (7)

(OR)

- b) (i) Explain with a neat sketch the construction and working of a single stage centrifugal Pump. (7)
- (ii) Name the three types of casings surrounding the impeller of a centrifugal pump. Draw neat sketches of them and explain. (7)
20. a) (i) Explain with a neat sketch and working principle of a double acting reciprocating pump. (7)
- (ii) Explain negative slip of a reciprocating pump and state the reasons for the same. (7)

(OR)

- b) (i) State the function of a hydraulic accumulator. Explain the working of a gravity type accumulator with a sketch. (7)
- (ii) Draw a hydraulic circuit with ISO symbols for quick return motion of a shaper. (7)

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