**Indian Maritime University**

**(A Central University, Govt of India)**

**End Semester Examinations – December 2025**

**Programme Name: B Tech (ME)**

**Semester: III**

**Subject Code: UG11T5301**

**Subject Name: FLUID MECHANICS AND HYDRAULIC MACHINERY**

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|---|---|
| Date: 06.12.2025 | Max Marks: 70 |
| Duration: 03 Hrs | Pass Marks: 35 |

General Instructions

(i) All Sections (A, B & C) are to be attempted.
(ii) Options, if any, are specified in respective section.

## Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. According to Pascal's Law, pressure at a point in a fluid acts:
   a. Vertically upwards
   b. Tangentially to the surface
   c. In all directions equally
   d. Along the direction of motion

2. Pressure difference between two points can be measured using
   a. Barometer
   b. Manometer
   c. Thermometer
   d. Venturimeter

3. Bernoulli's equation is based on the principle of conservation of:
   a. Mass
   b. Energy
   c. Momentum
   d. Volume

4. For laminar flow in a pipe, the Reynolds number is:
   a. Less than 2000
   b. Between 2000 and 4000
   c. Greater than 4000
   d. Always $10^5$

5. Major loss in a pipe flow is due to:
   a. Sudden enlargement
   b. Friction in the length of the pipe

c. Sudden contraction d. Bends and valves

6. The coefficient of velocity ($C_v$) is the ratio of:

a. Actual velocity / theoretical velocity

b. Actual discharge / theoretical discharge

c. Area of jet / area of orifice

d. Theoretical discharge / Actual discharge

7. Cavitation in a pump is caused by:

a. Excessive pressure b. High temperature

c. Low pressure at suction d. High viscosity

8. Net Positive Suction Head (NPSH) is defined as:

a. Total head + vapour pressure head

b. Total suction head minus vapour pressure head

c. Head at delivery side

d. Static head only

9. Why is a relief valve fitted on a positive displacement pump?

a. To regulate flow b. To prevent excessive pressure build-up

c. To increase efficiency d. To reduce noise

10. The main components of a reciprocating pump include:

a. Impeller, casing, and diffuser

b. Rotor, stator, and guide vanes

c. Shaft, bearings, and seals only

d. Piston, cylinder, suction and delivery valves

## Section B

Five Questions of 02 Marks each

11. Differentiate between absolute and gauge pressure?

12. Define the continuity equation for fluid flow.

13. Differentiate between major and minor losses in pipe flow?

14. Define priming and explain why it is necessary in a centrifugal pump?

15. State two advantages of positive displacement pumps.

## Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.

16. A differential manometer is connected at the two points A and B of two pipes as shown in the Figure.1. The pipe A contains a liquid of sp. gr. = 1.5 while pipe B contains a liquid of sp. gr. = 0.9. The pressures at A and B are 1 kgf/cm² and 1.80 kgf/cm² respectively. Find the difference in mercury level in the differential manometer.

(10 marks)

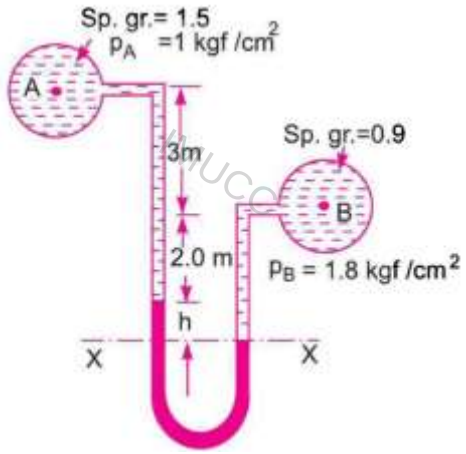


Fig.1

17. A venturi meter of 150 mm×75 mm size is used to measure the flow rate of oil having specific gravity of 0.9. The reading shown by the U tube manometer connected to the venturi meter is 150 mm of mercury column. Calculate the coefficient of discharge for the venturi meter if the flow rate is 1.7 m3/min. (Note: The size of venturi meter generally specified in terms of inlet and throat diameters).

(10 marks)

18. Explain the losses of head in the pumping system

(10 marks)

19. A pipeline 0.225 m in diameter and 1580 m long has a slope of 1 in 200 for the first 790 m and 1 in 100 for the next 790 m. The pressure at the upper end of the pipeline is 107.91 kPa and at the lower end is 53.955 kPa.

Taking frictional factor f = 0.032 determine the discharge through the pipe.

(10 marks)

20 a. Describe the working principle of single stage reciprocating pump with neat sketch?
b. Explain the purpose of an air vessel fitted to the discharge of reciprocating pump with neat sketch?

(5 +5 marks)

21 Explain the working principle of centrifugal pump with neat sketch?

(10 Marks)

22 a. Discuss the permissions required before pumping any fluids on board ships with reference to ship stability and pollution prevention?
b. Differentiate between positive displacement pumps and rotodynamic pumps?

(5 +5 marks)