

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

**Mar/Apr/26 SE**

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

**Semester: III**

**Subject Code: UG11T5301**

**Subject Name: Fluid Mechanics and Hydraulic Machinery**

Date: 18.03.2026

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) Which of the following is a unit of kinematic viscosity?

- (a)  $m^3/s$                       (b) poise                      (c) Pascal                      (d) stokes

(2) According to Newton's law of viscosity, the shear stress on a fluid element layer is directly proportional to

- (a) rate of shear strain    (b) density    (c) compressive strain    (d) shear strain

(3) If the value of Reynold's Number is 4080, the type of flow will be

- (a) unsteady    (b) transient    (c) laminar    (d) turbulent

(4) In a multistage centrifugal pump, to produce a high head the impellers are connected in

- (a) parallel    (b) series    (c) combine series and parallel    (d) none of these

(5) Which of the following is a mechanical pressure gauge

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(a) Diaphragm (b) Bourdon tube (c) Bellows (d) all of these

(6) Which of the following is a reciprocating type positive displacement pump

(a) gear pump (b) diaphragm pump (c) screw pump (d) rotary vane

(7) The Bernoulli's theorem defines

(a) Momentum equation (b) pressure equation (c) fluid force equation  
(d) total energy equation

(8) The coefficient of discharge value for venturimeter lies in the range

(a) 0.65 to 0.68 (b) 0.95 to 0.98 (c) 0.85 to 0.88 (d) 0.90 to 0.93

(9) The kinetic head in Bernoulli's equation is equivalent to

(a)  $v/2g$  (b)  $v^2/g$  (c)  $2v^2/g$  (d)  $v^2/2g$

(10) Which of the following is not a casing of centrifugal pump?

(a) volute casing (b) radial casing  
(c) vortex casing (d) casing with guide blades

**Section B**

**Five Questions of 02 Marks each**

Q.11 Define viscosity. What is Newton's law of viscosity?

Q.12 Define slip of reciprocating pump. What is negative slip?

Q.13 What is the difference between gauge pressure and vacuum pressure?

Q.14 What is coefficient of discharge? Give its range of values for venturimeter and orifice meter.

Q.15 Differentiate between centrifugal pumps and reciprocating pumps.

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**Section C**

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

Q.16 The space between two square flat parallel plates is filled with oil. Each side of the plate is 60 cm. The thickness of oil film is 12.5 mm. The upper plate which moves at 2.5 m/s requires a force of 98.1 N to maintain the speed.

Determine [10 marks]

(a) Dynamic viscosity of oil in poise

(b) Kinematic viscosity if the specific gravity of the oil is 0.95

Q.17 (A) State and prove Pascal's law. [7 marks]

Q.17 (B) Calculate the pressure due to a column of 0.3 m of (a) water [3 marks]

Q.18 State Bernoulli's theorem. Derive an expression for Bernoulli's theorem equation. What are various assumptions in Bernoulli's equation? [10 marks]

Q.19 If an oil of specific gravity 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturimeter. Take  $C_d = 0.98$  [10 marks]

Q.20 A jet of water of diameter 75 mm moving with a velocity of 30 m/s strikes a curved fixed plate tangentially at one end at an angle of  $30^\circ$  to the horizontal. The jet leaves the plate at an angle of  $20^\circ$  to the horizontal. Find the force exerted by the jet on the plate in horizontal and vertical directions.

[10 marks]

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Q.21 A double acting reciprocating pump running at 40 rpm is discharging  $1 \text{ m}^3$  of water per minute. The pump has a stroke of 400 mm and diameter of piston is 200 mm. The delivery and suction head are 20 m and 5 m respectively. Find the slip of pump and power required to drive the pump. [10 marks]

Q.22 Discuss the permissions required before pumping any fluids on board ships with reference to ship stability and pollution prevention?

[10 marks]

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