VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

SLOT: D2+TD2

SCHOOL OF MECHANICAL ENGINEERING

CONTINUOUS ASSESSMENT TEST – I

WINTERSEMESTER 2022-2023

Programme Name & Branch: B.Tech -Automotive, Mechanical, Manufacturing Engineering

Course Code:BMEE204L

Course Name: Fluid Mechanics and Machines

Faculty Name(s): Dr. SreejaSadasivan, Dr. Anuj Kumar, Dr. Sekarapandian N, Dr. Immanuel Selwyn Raj A

Emp.ID(s):14486, 15957, 15767, 14747

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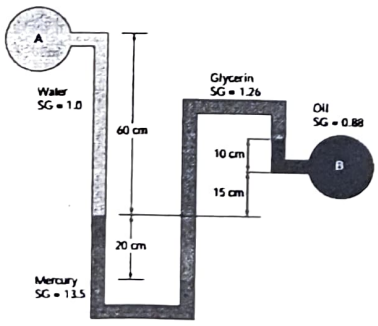
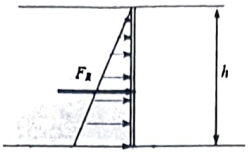
Class Number(s):VL2022230501045, VL2022230501046, VL2022230501047

Exam Duration:90 minutes **Maximum Marks:50**

General instruction(s):

Q.No	Question	Marks
1.	The dynamic viscosity of oil, used for lubrication between shaft and sleeve is 6 poise. The Shaft (diameter 0.4 m) rotates at 900 rpm. Calculate the power lost in bearing for a sleeve length of 90 mm. The thickness of oil film is 1.5 mm.	10
2.	a)A 170-kg granite rock (ρ=2700 kg/m^3) is dropped into a lake. A man dives in and tries to lift the rock. Determine how much force the man needs to apply to lift it from the bottom of the lake. (5 Marks)	10
	b) A 1.9-mm-diameter tube is inserted into an unknown liquid whose density is 960 kg/m^3, and it is observed that the liquid rises 5 mm in the tube, making a contact angle of 15°. Determine the surface tension of the liquid. (5 Marks)	
3.	The pressure difference between an oil pipe and water pipe is measured by a double-fluid manometer, as shown in Fig. For the given fluid heights and specific gravities, calculate the pressure difference $\Delta P = P_B - P_A$ 	10

4.	Consider a 4-m-long, 4-m-wide, and 1.5-m-high aboveground swimming pool that is filled with water to the rim. (a) Determine the hydrostatic force (FR) on each wall and the distance of the line of action of this force from the ground. (b) If the height of the walls of the pool is doubled and the pool is filled, will the hydrostatic force on each wall double or quadruple?  	10
5.	A steady, incompressible, two-dimensional velocity field is given by the following components in the xy-plane: $u = 1.1 + 2.8x + 0.65y \qquad v = 0.98 - 2.1x - 2.8y$ Calculate the acceleration field (a_x and a_y) and calculate the acceleration at the point (x, y) = (-2, 3)	10

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SLOT: D1

SCHOOL OF MECHANICAL ENGINEERING

CONTINUOUS ASSESSMENT TEST – I

WINTER SEMESTER 2022-2023

Programme Name & Branch: BMA, BME, BMM

Course Code: BMEE204L

Course Name: Fluid Mechanics and Machines

Faculty Name(s): Dr. MOHAMED IBRAHIM M; Dr. ARUNA KUMAR BEHURA; Dr. ABINASH MOHANTA; Dr. PRAVEEN KUMAR G; Dr. DEEPAKKUMAR R

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Class Number(s): VL2022230500741; 1043; 1040; 0747; 1042

Exam Duration: 90 minutes **Maximum Marks: 50**

General instruction(s):

Q.No	Question	Marks
1.	Calculate the dynamic viscosity of an oil, which is used for lubrication between a square plate of size 1m x 1m and an inclined plane with angle of inclination 20° as shown in Fig. 1. The weight of the square plate is 450 N and it slides down the inclined plane with a uniform velocity of 0.3 m/s. The thickness of oil film is 1.2 mm.	10

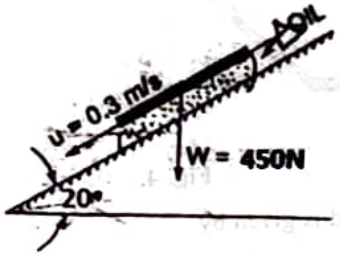

Fig. 1.

2.	A differential manometer is connected at the two points A and B as shown in Fig. 2. At B air pressure is 9.81 N/cm^2 (abs), find the absolute pressure at A.	10

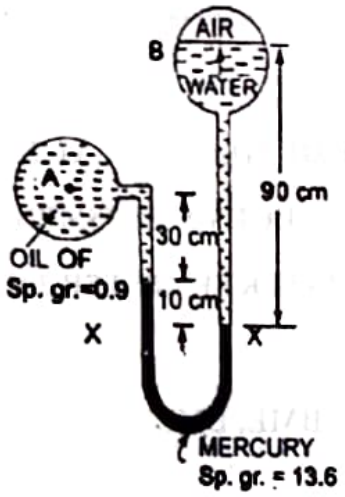

Fig. 2.

3. A solid cylinder is 250 mm in diameter and 500 mm high has its base made of 20 mm thick material of specific gravity 5 as shown in Fig. 3. The specific gravity of other part of cylinder is 0.8. Find out if it is stable in water. 10

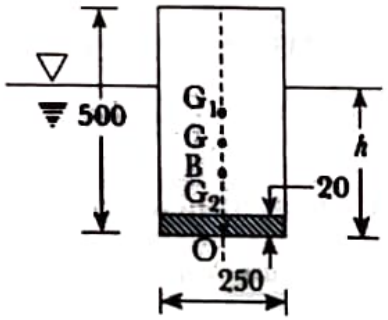

Fig. 3.

4. Compute the hydrostatic pressure force and the position of CP for the gates shown in Fig. 4. 10

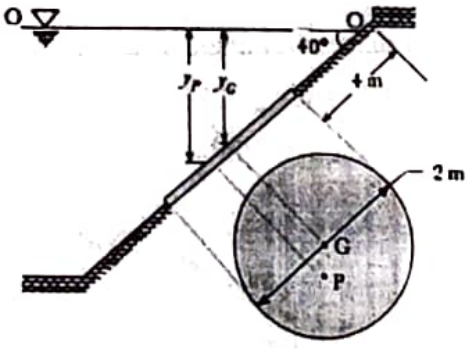

Fig. 4.

5. The eulerian velocity-vector field is given by

$$\mathbf{V} = 3t\,\mathbf{i} + xz\,\mathbf{j} + ty^2\,\mathbf{k}$$ 10

find the acceleration vector of a particle at a point (1,1,1) and time t = 2.