Roll No. _____

END SEMESTER EXAMINATION
SEMESTER- (New/Old Course)

COURSE CODE : ME 403 | **DURATION : 3 (THREE)HRS**
COURSE TITLE : Fluid Mechanics | **MAXIMUM MARKS : 75**
SESSION : JULY-DEC' 2021 | **PASS MARKS : 35 %**

NOTE: *1. Attempt any **5 (five)** questions.*
2. Mark for each question is shown against it.
3. Assume suitable logical data wherever necessary.

1. **(a)** Define : i)Mass density ii)Weight density iii) Specific volume iv) Specific gravity v) Kinematic viscosity **(5)**

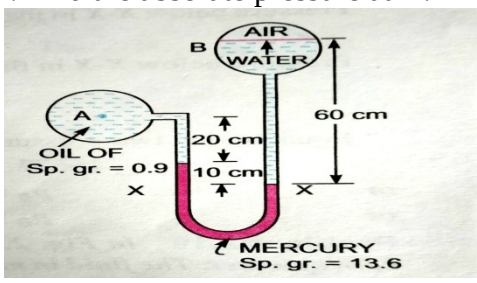
(b) Define: Absolute pressure, Gauge Pressure and Atmospheric pressure and also illustrate their relationship with the chart sketch. **(5)**

(c) A plate of area 1.5 x 10^6 mm^2 is pulled with speed of 0.4 m/s relative to another plate located at a distance of 0.15mm from it. Find the force and power required to maintain this speed, if the fluid separating them having viscosity as 1 poise. **(5)**

2. **(a)** Find the kinematic viscosity of an oil having density 981 Kg/m^3. The shear stress at a point in oil is 0.2452 N/m^2 and velocity gradient at the point is 0.2 per second. **(5)**

(b) A hydraulic press has a ram of 30 cm diameter and plunger of 4.5 cm diameter. Find the weight lifted by the hydraulic press when the force applied at the plunger is 500 N. **(5)**

(c) A differential manometer is connected at the two points A and B as shown in fig. At B air pressure is 9.81 N/cm^2. Find the absolute pressure at A. **(5)**



3. **(a)** Determine the total Pressure on a circular plate of diameter 1.5m which is placed vertically in water in such a way that the centre of the plate is 3 m below the free surface of water. Find the position of centre of pressure also. **(5)**

(b) A rectangular plane surface 2m wide and 3 m deep lies in water in such a way that its plane makes an angle 30° with the free surface of water. Determine the pressure and position of centre of pressure when the upper edge is 1.5 below the free water surface. **(10)**

4. **(a)** State Bernoulli's theorem. **(6)**

(b) Water is flowing through a pipe having diameter 300mm and 200mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm^2 and the pressure at the upper end is 9.81 N/cm^2. Determine the difference in datum head if the rate of flow through pipe is 40 lit/s. **(9)**

5. **(a)** What is buoyant force? What is the magnitude of the buoyant force acting on a submerged body of volume 'V'? **(5)**

(b) A rectangular pontoon is 5 m long, 3m wide and 1.20 m high. The depth of immersion of the pontoon is 0.80mm in sea water. If the centre of gravity is 0.6 m above the bottom of pontoon, determine the meta-centric height. The density for sea water is 1025 $kg/m^{3.}$ **(10)**

6. **(a)** Describe the condition of equilibrium of floating and submerged bodies relative to its centre of gravity (G) and centre of buoyancy (B) with suitable figures. **(15)**

7. **(a)** Derive the continuity equation. **(5)**

(b) A 30cm diameter pipe, conveying water, branches into two pipes of diameter 20 cm and 15 cm respectively. If the average velocity in the 30 cm diameter pipe is 2.5 m/s, find the discharge in this pipe. Also determine the velocity in 15 cm pipe if the average velocity in 20 cm diameter is 2m/s **(10)**

8. **(a)** Write short note on **(5x3)**

- **i)** Venturimeter
- **ii)** Manometer
- **iii)** Steady and unsteady flow
- **iv)** Uniform and non-uniform flow
- **v)** Laminar and turbulent flow

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