University of Mumbai
Examination First Half 2022
Program: BE Mechanical Engineering
Curriculum Scheme: Rev-2016
Examination: SE Semester IV
Course Code: MEC402 and Course Name: Fluid Mechanics
Time:2 hour 30 minutes Max.Marks:80

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| **Q1. Multiple Choice Questions** | **(20)** |
|---|---|
| Q1. | The square root of inertia force to viscous force is known as |
| Option A: | Reynolds number |
| Option B: | Froude number |
| Option C: | Nusselt number |
| Option D: | Prandtl Number |
| | |
| Q2. | Viscosity of the fluid with increase in temperature is |
| Option A: | Constant |
| Option B: | Increases |
| Option C: | Decreases |
| Option D: | No effect on viscosity |
| | |
| Q3. | Couttee flow is the flow of fluid |
| Option A: | In a circular pipe of uniform cross-section |
| Option B: | In a circular pipe of varying cross-section |
| Option C: | In between fixed parallel plates separated by distance b |
| Option D: | In between parallel plates one moving and one fixed separated by distance b |
| | |
| Q4. | Force of buoyancy is the |
| Option A: | Weight of body |
| Option B: | Weight of fluid |
| Option C: | Weight of fluid displaced by body |
| Option D: | Volume of body |
| | |
| Q5. | Control volume system is |
| Option A: | One in which both mass and energy entrainment is allowed |
| Option B: | One in which only mass entrainment is allowed |
| Option C: | One in which only energy entrainment is allowed |
| Option D: | One in which both mass and energy not allowed |
| | |
| Q6. | Uniform flow is the type of flow |
| Option A: | In which the velocity, pressure, density are constant with respect to time |
| Option B: | In which the velocity, pressure, density are constant with respect to space |
| Option C: | In which the velocity is constant with respect to space |
| Option D: | In which the pressure is constant with respect to space |
| | |
| Q7. | Rotameter is the device used to |
| Option A: | Measure density of the fluid |
| Option B: | Measure viscosity of the fluid |

| | |
|---|---|
| Option C: | Measure discharge of the fluid |
| Option D: | Measure the surface tension of the fluid |
| | |
| Q8. | The flow is said to be irrotational if |
| Option A: | Rotation components are non zero |
| Option B: | Rotation components are zero |
| Option C: | If stream function exist |
| Option D: | Vorticity is not zero |
| | |
| Q9. | The discharge between two stream function lines is |
| Option A: | The sum of those stream function lines |
| Option B: | The differentiation of those stream function lines |
| Option C: | The multiplication of those stream function lines |
| Option D: | The difference of those stream function lines |
| | |
| Q10. | Boundary Layer thickness is the |
| Option A: | Distance of the plane surface over which boundary layer formed |
| Option B: | Vertical distance from the plane surface over which boundary layer formed |
| Option C: | Velocity head of the fluid in boundary layer |
| Option D: | Velocity gradient of the fluid inside the boundary layer |
| | |

| **Q2. Answer any four** | **(20)** |
|---|---|
| a | A spherical water drop of 1 mm in diameter splits up in air in 64 smaller drops of equal size. Find the work required in splitting up the drop. The surface tension coefficient of water in air is 0.073 N/m. |
| b | Distinguish with the help of neat sketches, between a hydro dynamically rough surface and hydro dynamically smooth surface. |
| c | State Newton's Law of Viscosity and classify fluids with suitable examples. |
| d | The velocity distribution over a plate is given by<br>$u = \frac{3}{2}y - \frac{1}{2}y^2$<br>Where, $u$ =velocity, m/sec<br>$y$ = distance from the plate boundary, m<br>If the viscosity of the fluid is 8 poise find the shear stress at the plate boundary and at y= 0.15 m from the plate. |
| e | For the given **Figure 1,** calculate the minimum or just sufficient head H in the vessel and the corresponding discharge which can pass over the plate. (Take $Cv = 1; Cd = 0.8$) |

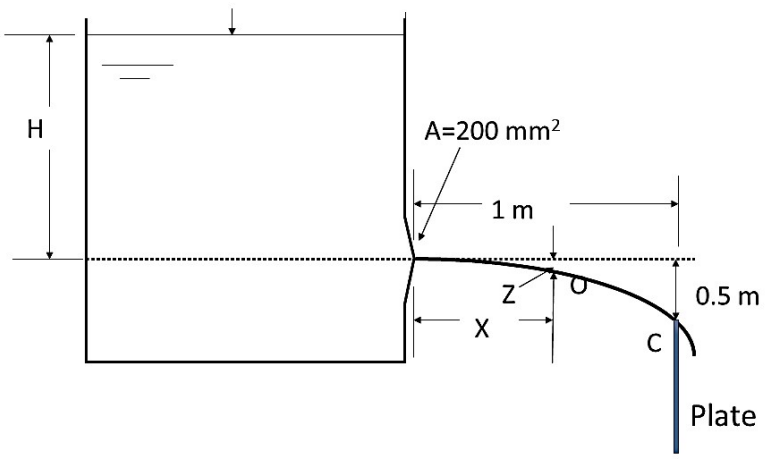


**Fig.1**

**Q3. Answer any two** **(20)**

a) If the velocity distribution in laminar boundary layer over a flat plate is $u = a + by + cy^2$, determine the velocity distribution form using necessary boundary conditions and find

a. Boundary Layer Thickness

b. Check whether the flow is attached or not.

b) Use the appropriate form of Navier-stokes equation to derive an equation of velocity profile in plane Poiseuille flow. State assumptions made at each stage. Plot the velocity distribution curve.

c)Write short note on Moody's Chart

**Q4. Answer any two** **(20)**

a) State Reynold's Transport Theorem. Using Reynold's Transport Theorem derive the mass flow rate equation and momentum equation.

b) Write short note on conditions of equilibrium for floating body and submerged body.

c) Explain the Lagrangian Approach and Eulerian approach for the fluid flow analysis. Also write their mathematical function.