# University of Mumbai
## Examination summer 2022

Program: Mechanical
Curriculum Scheme: REV- 2019 'C' Scheme
Examination: SE Semester: IV
Course Code: 402 and Course Name: **Fluid Mechanics**

Time: 3 hour Max. Marks: 80

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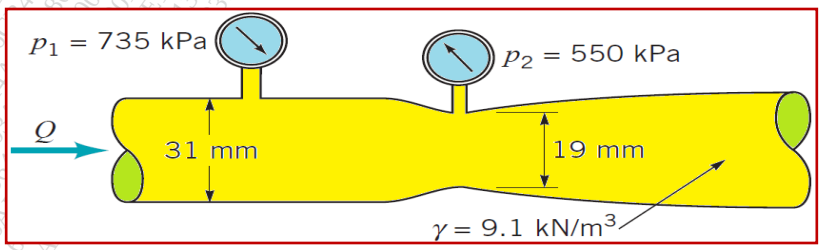
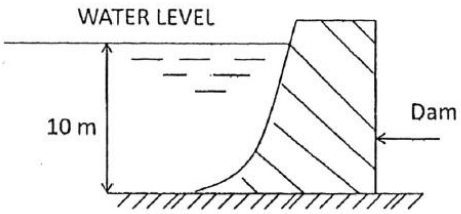
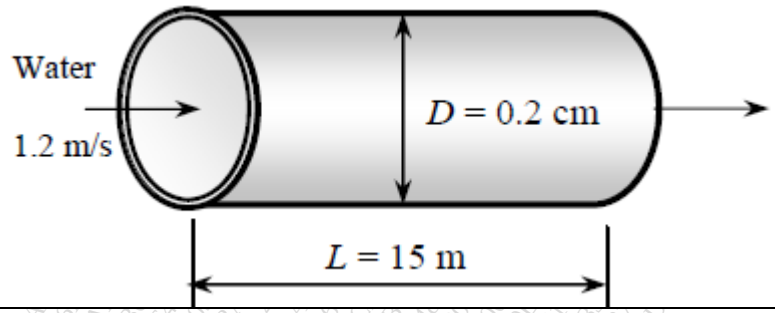
| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| 1. | The viscosity of liquids ……. With increase in temperature. |
| Option A: | decreases |
| Option B: | increases |
| Option C: | first decreases and then increases |
| Option D: | first increases and then decreases |
| | |
| 2. | Find Reynolds number if velocity of fluid is 2 m/s and density of fluid 800 kg/$m^3$ and Viscosity 0.2 N.s/$m^2$ is flowing through 0.25 m diameter pipe. |
| Option A: | 2000 |
| Option B: | 200 |
| Option C: | 20 |
| Option D: | 2 |
| | |
| 3. | …… is the square root of the ratio of the inertia force to the pressure force. |
| Option A: | Reynolds number |
| Option B: | Mach's number |
| Option C: | Euler's number |
| Option D: | Froude's number |
| | |
| 4. | The term $V^2$ /2g is known as |
| Option A: | Potential energy |
| Option B: | pressure energy |
| Option C: | kinetic energy per unit weight |
| Option D: | kinetic energy |
| | |
| 5. | **Which property of the fluid accounts for the major losses in pipes?** |
| Option A: | Density |
| Option B: | Specific gravity |
| Option C: | Viscosity |
| Option D: | Compressibility |
| | |
| 6. | If liquid has specific gravity 0.2, then what is weight density of the liquid? |
| Option A: | 200 N/$m^3$ |
| Option B: | 2000 N/$m^3$ |
| Option C: | 1962 N/$m^3$ |
| Option D: | 1.962 N/$m^3$ |
| | |
| 7. | **The Reynolds transport theorem establishes a relationship between _____ and _____** |
| Option A: | Control mass system, Control volume system |
| Option B: | Differential equation, Integral equation |
| Option C: | Non-conservative equation, Conservative equation |

| | |
|---|---|
| Option D: | Substantial derivative, Local derivative |
| | |
| 8. | The coefficient of discharge of Venturimeter lies within the limits: |
| Option A: | 0.95 to 0.99 |
| Option B: | 0.8 to 0.85 |
| Option C: | 0.7 to 0.8 |
| Option D: | 0.6 to 0.7 |
| | |
| 9. | The maximum velocity in a circular pipe when flow is laminar occurs at |
| Option A: | the top of the pipe |
| Option B: | the bottom of the pipe |
| Option C: | the centre of the pipe |
| Option D: | not necessarily at the centre |
| | |
| 10. | **What is the graph that is represented in the airfoil section?** |
| Option A: | Lift-moment ratio |
| Option B: | Coefficient of lift-coefficient of drag ratio |
| Option C: | Angle of attack-drag ratio |
| Option D: | Lift–angle of attack ratio |

| **Q2.** | |
|---|---|
| A | **Solve any Two** **5 marks each** |
| i. | What is Pascal law and Archimedes Principle?. |
| ii. | How do you determination of head loss in pipes due to friction |
| iii. | Write short notes on types of fluids. |
| B | **Solve any One** **10 marks each** |
| i. | A 1 m wide and 1.5 m deep rectangular plane surface lies in water in such a way that its plane makes an angle of 30° with the free water surface. Determine the total pressure and position of centre of pressure when the upper edge is 0.75 m below the free water surface. |
| ii. | In a two-dimensional incompressible flow, the fluid velocity components are given by $u = x - 4y$ and $v = -y - 4x$. Show that velocity potential exists and determine its form as well as stream function. |

| **Q3.** | |
|---|---|
| A | **Solve any Two** **5 marks each** |
| i. | What are the properties of Newtonian and non-Newtonian fluids? |
| ii. | With neat sketch explain working and construction of venturimeter |
| iii. | Write a short note on Buckingham's π theorem. |
| B | **Solve any One** **10 marks each** |
| i. | Determine the flow rate through the Venturimeter shown in figure ($\gamma=\rho g$)   |

| | |
|---|---|
| ii. | Find the magnitude and direction of the resultant water pressure acting on a curved face of a dam which is shaped according to the relation $y = (x^2/8)$ as shown in fig. The height of the water retained by the dam is 10 m. Consider the width of the dam as unity.<br>  <br> |

| **Q4.** | |
|---|---|
| **A** | **Solve any Two** **5 marks each** |
| i. | What is Reynolds transport theorem? What purpose does it serve? |
| ii. | Define stream function and velocity potential function. |
| iii. | Write short note on boundary layer separation and methods to control it |
| **B** | **Solve any One** **10 marks each** |
| i. | An oil of viscosity 9 poise and specific gravity 0.9 is flowing through a horizontal pipe of 60 mm diameter. If the pressure drop in 100 m length of the pipe is 1800 $kN/m^2$ determine the rate of flow of oil. |
| ii. | Water ( ρ= 999.7 kg/m3 and μ=1.307 x10-3 kg/m.s) is flowing in a 0.20-cm-diameter 15-m-long pipe steadily at an average velocity of 1.2 m/s.<br>**Determine**<br>(a) the pressure drop and<br>(b) The pumping power requirement to overcome this pressure drop<br>  <br> |