Code No: 07A30104 **R07** **Set No. 2**

II B.Tech I Semester Examinations,MAY 2011
FLUID MECHANICS
Civil Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) A piston 886mm diameter and 250mm long works in a cylinder of 900mm diameter. If the annular space is filled with a lubricating oil of viscosity 6 poise, calculate the speed of descent of piston in vertical position. The weight of piston and axial load are 11.8N.
   (b) Explain the phenomenon of vapour pressure. [10+6]

2. Three pipes of the same length L, diameter D, and friction factor f are connected in parallel. Determine the diameter of the pipe of length L and friction factor f which will carry the same discharge for the same head loss. Use the formula $h_f = \frac{4fLV^2}{2gD}$. [16]

3. 430 lt/sec of water is flowing in a pipe. The pipe is bent by 120^0. The pipe bend measures 360mm × 240mm and volume of the bend is $0.14m^3$. The pressure at the entrance is $72KN/m^2$ and the exit is 2.4m above the entrance section. Find the force exerted on the bend. [16]

4. For the velocity profile in laminar boundary layer given as u/U = 3/2 (y/δ)-1/2(y/δ)^3, find the thickness of the boundary layer and shear stress 1.8 m from the leading edge of a plate. The plate is 2.5 m long and 1.5 m wide and is placed in water which is moving with a velocity of 15 cm per second. Find the drag on one side of the plate, if the viscosity of water = 0.01 poise. [16]

5. (a) Define the term centre of pressure of the plane area immersed in a fluid. What relation has it got with the centre of gravity of the area? Do the centre of pressure and centre of gravity ever coincide and if so under what conditions?
   (b) Explain the term total pressure acting on a plane surface immersed in a fluid at any angle. Obtain an expression for this, and also for the corresponding depth of the centre of pressure. [8+8]

6. Petrol of specific gravity 0.8 is flowing through a pipe inclined at 30^0 to the horizontal in upward direction. A venturimeter is fitted in this 25 cm diameter pipe; the ratio of areas of main and throat is 4 and the throat is at a distance of 1.2 m from inlet along its length. The U-tube differential manometer connected to the inlet and throat section registers as steady reading of 5 cm of mercury ; the tubes above the mercury being full of water. Find the discharge and pressure difference in kPa between the throat and entrance section. The meter has a discharge coefficient of 0.95 and relative density of mercury is 13.6. [16]

7. (a) Define the equation of continuity. Obtain an expression for continuity equation for a three dimensional flow

   (b) In a two dimensional incompressible flow, the fluid velocty components are given by U=x-4y and V= -y-4x. show that velocity potential exists and determine its form as well as stream functions. [8+8]

8. Two parallel plates are placed horizontally 10 mm apart. The bottom plate is fixed and the top plate is moverd at a uniform speed of 0.25 m/s. The fluid between them has a dynamic viscosisty μ equal to 1.472 N.s/m^2. Find the pressure gradient which corresponds to the condition of zero discharge between the plates and the shearing stress at each plate. [16]

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Code No: 07A30104 **R07** **Set No. 4**

II B.Tech I Semester Examinations,MAY 2011
FLUID MECHANICS
Civil Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define the term centre of pressure of the plane area immersed in a fluid. What relation has it got with the centre of gravity of the area? Do the centre of pressure and centre of gravity ever coincide and if so under what conditions?
   (b) Explain the term total pressure acting on a plane surface immersed in a fluid at any angle. Obtain an expression for this, and also for the corresponding depth of the centre of pressure. [8+8]

2. Three pipes of the same length L, diameter D, and friction factor f are connected in parallel. Determine the diameter of the pipe of length L and friction factor f which will carry the same discharge for the same head loss. Use the formula $h_f = \frac{4fLV^2}{2gD}$. [16]

3. (a) A piston 886mm diameter and 250mm long works in a cylinder of 900mm diameter. If the annular space is filled with a lubricating oil of viscosity 6 poise, calculate the speed of descent of piston in vertical position. The weight of piston and axial load are 11.8N.
   (b) Explain the phenomenon of vapour pressure. [10+6]

4. For the velocity profile in laminar boundary layer given as u/U = 3/2 (y/δ)-1/2(y/δ)^3, find the thickness of the boundary layer and shear stress 1.8 m from the leading edge of a plate. The plate is 2.5 m long and 1.5 m wide and is placed in water which is moving with a velocity of 15 cm per second. Find the drag on one side of the plate, if the viscosity of water = 0.01 poise. [16]

5. Two parallel plates are placed horizontally 10 mm apart. The bottom plate is fixed and the top plate is moverd at a uniform speed of 0.25 m/s. The fluid between them has a dynamic viscosisty μ equal to 1.472 N.s/m^2. Find the pressure gradient which corresponds to the condition of zero discharge between the plates and the shearing stress at each plate. [16]

6. 430 lt/sec of water is flowing in a pipe. The pipe is bent by 120^0. The pipe bend measures 360mm × 240mm and volume of the bend is 0.14m^3. The pressure at the entrance is 72KN/m^2 and the exit is 2.4m above the entrance section. Find the force exerted on the bend. [16]

7. Petrol of specific gravity 0.8 is flowing through a pipe inclined at 30^0 to the horizontal in upward direction. A venturimeter is fitted in this 25 cm diameter pipe; the ratio of areas of main and throat is 4 and the throat is at a distance of 1.2 m from inlet along its length. The U-tube differential manometer connected to the inlet

and throat section registers as steady reading of 5 cm of mercury ; the tubes above the mercury being full of water. Find the discharge and pressure difference in kPa between the throat and entrance section. The meter has a discharge coefficient of 0.95 and relative density of mercury is 13.6. [16]

8. (a) Define the equation of continuity. Obtain an expression for continuity equation for a three dimensional flow

   (b) In a two dimensional incompressible flow, the fluid velocty components are given by U=x-4y and V= -y-4x. show that velocity potential exists and determine its form as well as stream functions. [8+8]

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Code No: 07A30104 **R07** **Set No. 1**

II B.Tech I Semester Examinations,MAY 2011
FLUID MECHANICS
Civil Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Three pipes of the same length L, diameter D, and friction factor f are connected in parallel. Determine the diameter of the pipe of length L and friction factor f which will carry the same discharge for the same head loss. Use the formula $h_f = \frac{4fLV^2}{2gD}$. [16]

2. (a) A piston 886mm diameter and 250mm long works in a cylinder of 900mm diameter. If the annular space is filled with a lubricating oil of viscosity 6 poise, calculate the speed of descent of piston in vertical position. The weight of piston and axial load are 11.8N.
   (b) Explain the phenomenon of vapour pressure. [10+6]

3. Two parallel plates are placed horizontally 10 mm apart. The bottom plate is fixed and the top plate is moverd at a uniform speed of 0.25 m/s. The fluid between them has a dynamic viscosisty μ equal to 1.472 N.s/m^2. Find the pressure gradient which corresponds to the condition of zero discharge between the plates and the shearing stress at each plate. [16]

4. 430 lt/sec of water is flowing in a pipe. The pipe is bent by 120^0. The pipe bend measures 360mm $\times$ 240mm and volume of the bend is 0.14m^3. The pressure at the entrance is 72KN/m^2 and the exit is 2.4m above the entrance section. Find the force exerted on the bend. [16]

5. Petrol of specific gravity 0.8 is flowing through a pipe inclined at 30^0 to the horizontal in upward direction. A venturimeter is fitted in this 25 cm diameter pipe; the ratio of areas of main and throat is 4 and the throat is at a distance of 1.2 m from inlet along its length. The U-tube differential manometer connected to the inlet and throat section registers as steady reading of 5 cm of mercury ; the tubes above the mercury being full of water. Find the discharge and pressure difference in kPa between the throat and entrance section. The meter has a discharge coefficient of 0.95 and relative density of mercury is 13.6. [16]

6. (a) Define the equation of continuity. Obtain an expression for continuity equation for a three dimensional flow
   (b) In a two dimensional incompressible flow, the fluid velocty components are given by U=x-4y and V= -y-4x. show that velocity potential exists and determine its form as well as stream functions. [8+8]

7. For the velocity profile in laminar boundary layer given as u/U = 3/2 (y/δ)-1/2(y/δ)^3, find the thickness of the boundary layer and shear stress 1.8 m from

the leading edge of a plate. The plate is 2.5 m long and 1.5 m wide and is placed in water which is moving with a velocity of 15 cm per second. Find the drag on one side of the plate, if the viscosity of water = 0.01 poise. [16]

8. (a) Define the term centre of pressure of the plane area immersed in a fluid. What relation has it got with the centre of gravity of the area? Do the centre of pressure and centre of gravity ever coincide and if so under what conditions?

   (b) Explain the term total pressure acting on a plane surface immersed in a fluid at any angle. Obtain an expression for this, and also for the corresponding depth of the centre of pressure. [8+8]

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Code No: 07A30104 **R07** **Set No. 3**

II B.Tech I Semester Examinations,MAY 2011
FLUID MECHANICS
Civil Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Three pipes of the same length L, diameter D, and friction factor f are connected in parallel. Determine the diameter of the pipe of length L and friction factor f which will carry the same discharge for the same head loss. Use the formula $h_f = \frac{4fLV^2}{2gD}$. [16]

2. (a) Define the equation of continuity. Obtain an expression for continuity equation for a three dimensional flow

   (b) In a two dimensional incompressible flow, the fluid velocty components are given by U=x-4y and V= -y-4x. show that velocity potential exists and determine its form as well as stream functions. [8+8]

3. Petrol of specific gravity 0.8 is flowing through a pipe inclined at 30^0 to the horizontal in upward direction. A venturimeter is fitted in this 25 cm diameter pipe; the ratio of areas of main and throat is 4 and the throat is at a distance of 1.2 m from inlet along its length. The U-tube differential manometer connected to the inlet and throat section registers as steady reading of 5 cm of mercury ; the tubes above the mercury being full of water. Find the discharge and pressure difference in kPa between the throat and entrance section. The meter has a discharge coefficient of 0.95 and relative density of mercury is 13.6. [16]

4. (a) Define the term centre of pressure of the plane area immersed in a fluid. What relation has it got with the centre of gravity of the area? Do the centre of pressure and centre of gravity ever coincide and if so under what conditions?

   (b) Explain the term total pressure acting on a plane surface immersed in a fluid at any angle. Obtain an expression for this, and also for the corresponding depth of the centre of pressure. [8+8]

5. (a) A piston 886mm diameter and 250mm long works in a cylinder of 900mm diameter. If the annular space is filled with a lubricating oil of viscosity 6 poise, calculate the speed of descent of piston in vertical position. The weight of piston and axial load are 11.8N.

   (b) Explain the phenomenon of vapour pressure. [10+6]

6. Two parallel plates are placed horizontally 10 mm apart. The bottom plate is fixed and the top plate is moverd at a uniform speed of 0.25 m/s. The fluid between them has a dynamic viscosisty μ equal to 1.472 N.s/m^2. Find the pressure gradient which corresponds to the condition of zero discharge between the plates and the shearing stress at each plate. [16]

7. For the velocity profile in laminar boundary layer given as u/U = 3/2 (y/δ)-1/2(y/δ)^3, find the thickness of the boundary layer and shear stress 1.8 m from the leading edge of a plate. The plate is 2.5 m long and 1.5 m wide and is placed in water which is moving with a velocity of 15 cm per second. Find the drag on one side of the plate, if the viscosity of water = 0.01 poise. [16]

8. 430 lt/sec of water is flowing in a pipe. The pipe is bent by 120^0. The pipe bend measures 360mm $\times$ 240mm and volume of the bend is 0.14m^3. The pressure at the entrance is 72KN/m^2 and the exit is 2.4m above the entrance section. Find the force exerted on the bend. [16]

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