Code No: RR220301 **RR** **Set No. 2**

II B.Tech II Semester Examinations,December 2010
MECHANICS OF FLUIDS
Common to Mechanical Engineering, Automobile Engineering, Metallurgy And Material Technology

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

Answer any FIVE Questions
All Questions carry equal marks

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1. A 120 mm diameter pipe reduces to 60 mm diameter through a Sudden contraction. When it carries air at 25^0 C under isothermal condition, the absolute pressure observed in the two pipes just before and after contraction are 480 KN/m^2 and 384 KN/m^2 respectively. Determine
   (a) Densities at two section
   (b) Velocity at two section
   (c) Mass flow rate of the pipe. [8+8]

2. (a) Derive Hazen-poisehille equation for laminar flow in circular pipes.
   (b) Explain in detail how the flow is demonstrated using Reynold's experiment. [8+8]

3. (a) A venturimeter is used for measuring the flow of petrol (G = 0.81) in a pipeline inclined at 35^0 to the horizontal. The throat area ratio is 4. If the difference in mercury levels in the gage is 50 mm, calculate the flow if the pipe dia is 30 m. Take $C_d = 0.975$. Take specific gravity of mercury as 13.6.
   (b) Explain the working of Bourdon pressure gage with a sketch. [8+8]

4. (a) Write a note on viscosity and compressibility.
   (b) Calculate the velocity gradient at distances of 0,10,15 cm from the boundary if the velocity profile is a parabola given by u $= Ay^2$ + By + C and with the vertex 15cm from the boundary, where the velocity is 100 cm/sec. Also calculate the shear stress at these points if the fluid has a viscosity of 8.2 poise. [8+8]

5. (a) Obtain an expression for head loss due to sudden expansion in the pipe. List all the assumptions made in the derivation.
   (b) If two pipes of diameters D and d and equal length L are arranged in parallel, the loss of head for a flow of Q is h. If the same pipes are arranged in series, the loss of head for the same flow Q is H. If d = 0.5D, find the percentage of total flow through each pipe when placed in parallel and the ratio (H/h). Neglect minor losses and assume f to be constant. [8+8]

6. (a) The velocity components in x and y directions are given as
   $U = \frac{2XY^3}{3} - 2XY$
   $\vartheta = XY^2 - \frac{2YX^3}{3}$

Indicate whether the given velocity components represent a case of possible flow field or not.

(b) Show and deduce the relation between stream and velocity potential functions. [8+8]

7. (a) Write a note on free vertex and forced vertex flow.

(b) List out the engineering applications of Bernoulli's equation. [8+8]

8. (a) Why is it necessary to control the growth of boundary layer on most of the bodies? What methods are used for such a control?

(b) A sphere has a projected area of $1m^2$. Compare the drag force in water and in air when travelling at a speed of 30 km/hr. [8+8]

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Code No: RR220301 **RR** **Set No. 4**

II B.Tech II Semester Examinations,December 2010
MECHANICS OF FLUIDS
Common to Mechanical Engineering, Automobile Engineering, Metallurgy And Material Technology

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Obtain an expression for head loss due to sudden expansion in the pipe. List all the assumptions made in the derivation.
   (b) If two pipes of diameters D and d and equal length L are arranged in parallel, the loss of head for a flow of Q is h. If the same pipes are arranged in series, the loss of head for the same flow Q is H. If d = 0.5D, find the percentage of total flow through each pipe when placed in parallel and the ratio (H/h). Neglect minor losses and assume f to be constant. [8+8]

2. A 120 mm diameter pipe reduces to 60 mm diameter through a Sudden contraction. When it carries air at 25^0 C under isothermal condition, the absolute pressure observed in the two pipes just before and after contraction are 480 KN/m^2 and 384 KN/m^2 respectively. Determine
   (a) Densities at two section
   (b) Velocity at two section
   (c) Mass flow rate of the pipe. [8+8]

3. (a) Write a note on viscosity and compressibility.
   (b) Calculate the velocity gradient at distances of 0,10,15 cm from the boundary if the velocity profile is a parabola given by u $=Ay^2$ + By + C and with the vertex 15cm from the boundary, where the velocity is 100 cm/sec. Also calculate the shear stress at these points if the fluid has a viscosity of 8.2 poise. [8+8]

4. (a) Write a note on free vertex and forced vertex flow.
   (b) List out the engineering applications of Bernoulli's equation. [8+8]

5. (a) The velocity components in x and y directions are given as
   $U = \frac{2XY^3}{3} - 2XY$
   $\vartheta = XY^2 - \frac{2YX^3}{3}$
   Indicate whether the given velocity components represent a case of possible flow field or not.
   (b) Show and deduce the relation between stream and velocity potential functions. [8+8]

6. (a) A venturimeter is used for measuring the flow of petrol (G = 0.81) in a pipeline inclined at 35^0 to the horizontal. The throat area ratio is 4. If the difference in mercury levels in the gage is 50 mm, calculate the flow if the pipe dia is 30 m. Take $C_d = 0.975$. Take specific gravity of mercury as 13.6.

   (b) Explain the working of Bourdon pressure gage with a sketch. [8+8]

7. (a) Derive Hazen-poisehille equation for laminar flow in circular pipes.

   (b) Explain in detail how the flow is demonstrated using Reynold's experiment. [8+8]

8. (a) Why is it necessary to control the growth of boundary layer on most of the bodies? What methods are used for such a control?

   (b) A sphere has a projected area of $1m^2$. Compare the drag force in water and in air when travelling at a speed of 30 km/hr. [8+8]

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Code No: RR220301 **RR** **Set No. 1**

II B.Tech II Semester Examinations,December 2010
MECHANICS OF FLUIDS
Common to Mechanical Engineering, Automobile Engineering, Metallurgy And Material Technology

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

Answer any FIVE Questions
All Questions carry equal marks

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1. A 120 mm diameter pipe reduces to 60 mm diameter through a Sudden contraction. When it carries air at 25^0 C under isothermal condition, the absolute pressure observed in the two pipes just before and after contraction are 480 KN/m^2 and 384 KN/m^2 respectively. Determine
   (a) Densities at two section
   (b) Velocity at two section
   (c) Mass flow rate of the pipe. [8+8]

2. (a) Write a note on free vertex and forced vertex flow.
   (b) List out the engineering applications of Bernoulli's equation. [8+8]

3. (a) Derive Hazen-poisehille equation for laminar flow in circular pipes.
   (b) Explain in detail how the flow is demonstrated using Reynold's experiment. [8+8]

4. (a) Why is it necessary to control the growth of boundary layer on most of the bodies? What methods are used for such a control?
   (b) A sphere has a projected area of $1m^2$. Compare the drag force in water and in air when travelling at a speed of 30 km/hr. [8+8]

5. (a) A venturimeter is used for measuring the flow of petrol (G = 0.81) in a pipeline inclined at 35^0 to the horizontal. The throat area ratio is 4. If the difference in mercury levels in the gage is 50 mm, calculate the flow if the pipe dia is 30 m. Take $C_d = 0.975$. Take specific gravity of mercury as 13.6.
   (b) Explain the working of Bourdon pressure gage with a sketch. [8+8]

6. (a) The velocity components in x and y directions are given as
   $U = \frac{2XY^3}{3} - 2XY$
   $\vartheta = XY^2 - \frac{2YX^3}{3}$
   Indicate whether the given velocity components represent a case of possible flow field or not.
   (b) Show and deduce the relation between stream and velocity potential functions. [8+8]

7. (a) Write a note on viscosity and compressibility.

(b) Calculate the velocity gradient at distances of 0,10,15 cm from the boundary if the velocity profile is a parabola given by u $=Ay^2$ + By + C and with the vertex 15cm from the boundary, where the velocity is 100 cm/sec. Also calculate the shear stress at these points if the fluid has a viscosity of 8.2 poise. [8+8]

8. (a) Obtain an expression for head loss due to sudden expansion in the pipe. List all the assumptions made in the derivation.

(b) If two pipes of diameters D and d and equal length L are arranged in parallel, the loss of head for a flow of Q is h. If the same pipes are arranged in series, the loss of head for the same flow Q is H. If d = 0.5D, find the percentage of total flow through each pipe when placed in parallel and the ratio (H/h). Neglect minor losses and assume f to be constant. [8+8]

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Code No: RR220301 **RR** **Set No. 3**

II B.Tech II Semester Examinations,December 2010
MECHANICS OF FLUIDS
Common to Mechanical Engineering, Automobile Engineering, Metallurgy And Material Technology

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Why is it necessary to control the growth of boundary layer on most of the bodies? What methods are used for such a control?
   (b) A sphere has a projected area of $1m^2$. Compare the drag force in water and in air when travelling at a speed of 30 km/hr. [8+8]
2. (a) Derive Hazen-poisehille equation for laminar flow in circular pipes.
   (b) Explain in detail how the flow is demonstrated using Reynold's experiment. [8+8]
3. (a) Obtain an expression for head loss due to sudden expansion in the pipe. List all the assumptions made in the derivation.
   (b) If two pipes of diameters D and d and equal length L are arranged in parallel, the loss of head for a flow of Q is h. If the same pipes are arranged in series, the loss of head for the same flow Q is H. If d = 0.5D, find the percentage of total flow through each pipe when placed in parallel and the ratio (H/h). Neglect minor losses and assume f to be constant. [8+8]
4. (a) Write a note on viscosity and compressibility.
   (b) Calculate the velocity gradient at distances of 0,10,15 cm from the boundary if the velocity profile is a parabola given by u $=Ay^2$ + By + C and with the vertex 15cm from the boundary, where the velocity is 100 cm/sec. Also calculate the shear stress at these points if the fluid has a viscosity of 8.2 poise. [8+8]
5. A 120 mm diameter pipe reduces to 60 mm diameter through a Sudden contraction. When it carries air at 25^0 C under isothermal condition, the absolute pressure observed in the two pipes just before and after contraction are 480 KN/m^2 and 384 KN/m^2 respectively. Determine
   (a) Densities at two section
   (b) Velocity at two section
   (c) Mass flow rate of the pipe. [8+8]
6. (a) A venturimeter is used for measuring the flow of petrol (G = 0.81) in a pipeline inclined at 35^0 to the horizontal. The throat area ratio is 4. If the difference in mercury levels in the gage is 50 mm, calculate the flow if the pipe dia is 30 m. Take $C_d = 0.975$. Take specific gravity of mercury as 13.6.

(b) Explain the working of Bourdon pressure gage with a sketch. [8+8]

7. (a) The velocity components in x and y directions are given as
$U = \frac{2XY^3}{3} - 2XY$
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Indicate whether the given velocity components represent a case of possible flow field or not.

(b) Show and deduce the relation between stream and velocity potential functions. [8+8]

8. (a) Write a note on free vertex and forced vertex flow.

(b) List out the engineering applications of Bernoulli's equation. [8+8]

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