Code No: 07A30105 **R07** **Set No. 2**

II B.Tech I Semester Examinations,November 2010
MECHANICS OF FLUIDS
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What is a siphon? Where is it used?
   (b) Two pipes 1 and 2, each of 12 cm diameter branch off from a point A in a pipeline and rejoin at B. Pipe 1 is 480 m long and pipe 2 is 720 m long. So total head at A is 36 m. A short pipe 10 cm diameter is fitted at B and the flow is discharged into atmosphere through it. Assuming f = 0.018 for both the pipes. Calculate:
      i. Total discharge and
      ii. Distribution of discharge in pipes 1 and 2. [4+12]

2. (a) What is the effect of modulus of fluid on the velocity of sound in it? Explain why the velocity of sound in compressible flow is lower than that in incompressible flow?
   (b) The static and stagnation temperature of a stream of air are 15 ^{0}C and 50 ^{0}C respectively.
      i. Estimate the Mach number and flow velocity.
      ii. What would be the percentage rise in pressure between stagnation and static values if the compression process is assumed to be reversible adiabatic? [6+10]

3. (a) Differentiate between:
      i. Stream line body and bluff body
      ii. Friction drag and pressure drag.
   (b) A kite 0.8m × 0.8m weighing 0.4 kgf assumes an angle of 12^0 to the horizontal. The string attached to the kite makes an angle of 45^0 to the horizontal. The pull on the string is 2.5 kgf when the wind is flowing at a speed of 30 km/hour. Find the corresponding coefficient of drag and lift. Density of air is given as 1.25 kg/m^3. [6+10]

4. Explain the terms geometric similarity, kinematic similarity and dynamic similarity and discuss the difficulties faced in satisfying these three similarity laws in modeling studies. [16]

5. (a) Write down the continuity equation for a uni dimensional unsteady state in compressible flow.
   (b) Calculate the velocity components for the flow given by $\phi = \frac{Ax}{(x^2+y^2)}$ where A = constant. [4+12]

6. A pipe 200 m long slopes down at 1 in 100 and tapers from 800 mm diameter at the higher end to 400 mm diameter at the lower end, and carries 100 l/s of oil. (Specific gravity of oil is 0.85). If the pressure at the higher end reads 50 kN/m^2, determine

   (a) the velocities at the two ends, and

   (b) pressure at the lower end. Assume that the losses are negligible. [16]

7. (a) What is the critical velocity of flow in a circular pipe? What are the upper and lower critical velocity values?

   (b) An oil with kinematic viscosity 1.35 $\times$ 10^{-5} m^2/s flows through a 15 cm diameter pipe. Below what velocity the flow will be laminar? For laminar flow, assume $R_r \leq 2000$. [8+8]

8. An inclined manometer is required to measure an air pressure of 3mm of water to an accuracy of +/- 3%. The inclined arm is 8mm in diameter and the larger arm has a diameter of 24mm. The manometric fluid has density 740 kg/m^3 and the scale may be read to +/- 0.5mm. What is the angle required to ensure the desired accuracy? [16]

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Code No: 07A30105 **R07** **Set No. 4**

II B.Tech I Semester Examinations,November 2010
MECHANICS OF FLUIDS
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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   (a) the velocities at the two ends, and
   (b) pressure at the lower end. Assume that the losses are negligible. [16]

2. (a) What is the effect of modulus of fluid on the velocity of sound in it? Explain why the velocity of sound in compressible flow is lower than that in incompressible flow?
   (b) The static and stagnation temperature of a stream of air are 15 ^{0}C and 50 ^{0}C respectively.
      i. Estimate the Mach number and flow velocity.
      ii. What would be the percentage rise in pressure between stagnation and static values if the compression process is assumed to be reversible adiabatic? [6+10]

3. (a) Differentiate between:
      i. Stream line body and bluff body
      ii. Friction drag and pressure drag.
   (b) A kite 0.8m × 0.8m weighing 0.4 kgf assumes an angle of 12^0 to the horizontal. The string attached to the kite makes an angle of 45^0 to the horizontal. The pull on the string is 2.5 kgf when the wind is flowing at a speed of 30 km/hour. Find the corresponding coefficient of drag and lift. Density of air is given as 1.25 kg/m^3. [6+10]

4. Explain the terms geometric similarity, kinematic similarity and dynamic similarity and discuss the difficulties faced in satisfying these three similarity laws in modeling studies. [16]

5. (a) What is the critical velocity of flow in a circular pipe? What are the upper and lower critical velocity values?
   (b) An oil with kinematic viscosity 1.35 × 10^{-5} m^2/s flows through a 15 cm diameter pipe. Below what velocity the flow will be laminar? For laminar flow, assume $R_r \leq 2000$. [8+8]

6. An inclined manometer is required to measure an air pressure of 3mm of water to an accuracy of +/- 3%. The inclined arm is 8mm in diameter and the larger arm has a diameter of 24mm. The manometric fluid has density 740 kg/m^3 and the scale may be read to +/- 0.5mm. What is the angle required to ensure the desired accuracy? [16]

7. (a) What is a siphon? Where is it used?

   (b) Two pipes 1 and 2, each of 12 cm diameter branch off from a point A in a pipeline and rejoin at B. Pipe 1 is 480 m long and pipe 2 is 720 m long. So total head at A is 36 m. A short pipe 10 cm diameter is fitted at B and the flow is discharged into atmosphere through it. Assuming f = 0.018 for both the pipes. Calculate:

      i. Total discharge and

      ii. Distribution of discharge in pipes 1 and 2. [4+12]

8. (a) Write down the continuity equation for a uni dimensional unsteady state in compressible flow.

   (b) Calculate the velocity components for the flow given by $\phi = \frac{Ax}{(x^2+y^2)}$ where A = constant. [4+12]

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Code No: 07A30105 **R07** **Set No. 1**

II B.Tech I Semester Examinations,November 2010
MECHANICS OF FLUIDS
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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   (b) Calculate the velocity components for the flow given by $\phi = \frac{Ax}{(x^2+y^2)}$ where A = constant. [4+12]

2. (a) What is the effect of modulus of fluid on the velocity of sound in it? Explain why the velocity of sound in compressible flow is lower than that in incompressible flow?
   (b) The static and stagnation temperature of a stream of air are 15 ^{0}C and 50 ^{0}C respectively.
      i. Estimate the Mach number and flow velocity.
      ii. What would be the percentage rise in pressure between stagnation and static values if the compression process is assumed to be reversible adiabatic? [6+10]

3. (a) Differentiate between:
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      ii. Friction drag and pressure drag.
   (b) A kite 0.8m × 0.8m weighing 0.4 kgf assumes an angle of 12^0 to the horizontal. The string attached to the kite makes an angle of 45^0 to the horizontal. The pull on the string is 2.5 kgf when the wind is flowing at a speed of 30 km/hour. Find the corresponding coefficient of drag and lift. Density of air is given as 1.25 kg/m^3. [6+10]

4. A pipe 200 m long slopes down at 1 in 100 and tapers from 800 mm diameter at the higher end to 400 mm diameter at the lower end, and carries 100 l/s of oil. (Specific gravity of oil is 0.85). If the pressure at the higher end reads 50 kN/m^2, determine
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      i. Total discharge and

      ii. Distribution of discharge in pipes 1 and 2. [4+12]

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Code No: 07A30105 **R07** **Set No. 3**

II B.Tech I Semester Examinations,November 2010
MECHANICS OF FLUIDS
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Write down the continuity equation for a uni dimensional unsteady state in compressible flow.
   (b) Calculate the velocity components for the flow given by $\phi = \frac{Ax}{(x^2+y^2)}$ where A = constant. [4+12]

2. (a) Differentiate between:
      i. Stream line body and bluff body
      ii. Friction drag and pressure drag.
   (b) A kite 0.8m × 0.8m weighing 0.4 kgf assumes an angle of 12^0 to the horizontal. The string attached to the kite makes an angle of 45^0 to the horizontal. The pull on the string is 2.5 kgf when the wind is flowing at a speed of 30 km/hour. Find the corresponding coefficient of drag and lift. Density of air is given as 1.25 kg/m^3. [6+10]

3. (a) What is a siphon? Where is it used?
   (b) Two pipes 1 and 2, each of 12 cm diameter branch off from a point A in a pipeline and rejoin at B. Pipe 1 is 480 m long and pipe 2 is 720 m long. So total head at A is 36 m. A short pipe 10 cm diameter is fitted at B and the flow is discharged into atmosphere through it. Assuming f = 0.018 for both the pipes. Calculate:
      i. Total discharge and
      ii. Distribution of discharge in pipes 1 and 2. [4+12]

4. (a) What is the critical velocity of flow in a circular pipe? What are the upper and lower critical velocity values?
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   (b) The static and stagnation temperature of a stream of air are 15 ^{0}C and 50 ^{0}C respectively.
      i. Estimate the Mach number and flow velocity.

ii. What would be the percentage rise in pressure between stagnation and static values if the compression process is assumed to be reversible adiabatic? [6+10]

6. A pipe 200 m long slopes down at 1 in 100 and tapers from 800 mm diameter at the higher end to 400 mm diameter at the lower end, and carries 100 l/s of oil. (Specific gravity of oil is 0.85). If the pressure at the higher end reads 50 kN/m^2, determine

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