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

II B.Tech I Semester Examinations,November 2010
FLUID MECHANICS
Civil Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. The friction factor for turbulent flow through rough pipes can be determined by Karman- Prandtl equation, $1/\sqrt{f} = 2 \log_{10} (R_0/k) + 1.74$ where f= friction factor, R_0 = pipe radius, k = average roughness.
   Two reservoirs with a surface level difference of 20 metres are to be connected by 1 metre diameter pipe 6 km long. What will be the discharge when a cast iron pipe of roughness k = 0.3 mm is used ? what will be the percentage increase in the discharge if the cast iron pipe is replaced by a steel pipe of roughness k = 0.1 mm? Neglect all local losses. [16]

2. A tank 1.5m ×1.5m ×1.5m is filled with water upto 0.5m height and remaining is filled with an oil of 0.8 specific gravity:
   (a) Determine total pressure force on one side of the tank and
   (b) Position of centre of pressure. [16]

3. (a) Differentiate between the Eulerian and Lagrangian methods of representation of fluid flow.
   b) A flow field is represented by a velocity potential function as given below $\phi = c(2x^2 - 3y^2)$ verify whether it is a valid function or not? If valid, then find out the corresponding stream function [8+8]

4. The angle of a reducing bend is 60^0 (that is deviation from initial direction to final direction). Its initial diameter is 300mm and final diameter 150mm and is fitted in a pipe line, carrying a discharge of 300lit/sec. The pressure at the commencement of the bend is 2.94bar. The friction loss in the pipe bend may be assumend as 10% of K.E at exit of the bend. Determine the force exerted by the reducing bend. [16]

5. (a) Derive Darcy-Weisbach equation.
   (b) Define the following terms:
      i. Viscosity
      ii. Kinematic viscosity
      iii. Velocity gradient. [10+6]

6. (a) Explain the working principle of Bourdon pressure gauge with the help of a neat sketch.

(b) An inverted U-tube manometer is connected to two horizontal pipes A and B through which water is flowing. The vertical distance between the axes of these pipes is 20cm. When an oil of specific gravity 0.7 is used as a gauge fluid, the vertical heights of water columns in the two limbs of the inverted manometer (when measured from the respective centre lines of the pipes) are found to be same and equal to 25cm. Sketch the configuration. Determine the difference of pressure between the pipes. [8+8]

7. (a) Find the throat diameter of a venturimeter, when fitted to a horizontal main 10 cm diameter having a discharges of 20 litres per second. Pressure gauges inserted at the entrance and throat indicate pressures 158 kPa and 82 kPa respectively. Take $C_d = 0.95$.

   (b) If instead of pressure gauges, the entrance and throat of the meter are connected to the two limbs of a U-tube mercury manometer, determine its reading in cm of differential mercury column.

   (c) In case the venturimeter is located in a vertical pipe, with water flowing upwards, find the difference in the readings of the mercury manometer. Throat section is 20 cm above the entrance section of the venturimeter. Further, dimensions of pipe and venturimeter remain unaltered, as well as the discharge through the pipe. [6+6+4]

8. (a) Derive Von Karman momentum integral equation.

   (b) Find the displacement thickness for the velocity distribution in the boundry layer given by $\frac{u}{U} = 2\left(\frac{y}{s}\right) - \left(\frac{y}{s}\right)^2$ [10+6]

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

II B.Tech I Semester Examinations,November 2010
FLUID MECHANICS
Civil Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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   Two reservoirs with a surface level difference of 20 metres are to be connected by 1 metre diameter pipe 6 km long. What will be the discharge when a cast iron pipe of roughness k = 0.3 mm is used ? what will be the percentage increase in the discharge if the cast iron pipe is replaced by a steel pipe of roughness k = 0.1 mm? Neglect all local losses. [16]

2. (a) Differentiate between the Eulerian and Lagrangian methods of representation of fluid flow.

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   (a) Determine total pressure force on one side of the tank and
   (b) Position of centre of pressure. [16]

4. (a) Derive Von Karman momentum integral equation.
   (b) Find the displacement thickness for the velocity distribution in the boundry layer given by $\frac{u}{U} = 2\left(\frac{y}{s}\right) - \left(\frac{y}{s}\right)^2$ [10+6]

5. The angle of a reducing bend is 60^0 (that is deviation from initial direction to final direction). Its initial diameter is 300mm and final diameter 150mm and is fitted in a pipe line, carrying a discharge of 300lit/sec. The pressure at the commencement of the bend is 2.94bar. The friction loss in the pipe bend may be assumend as 10% of K.E at exit of the bend. Determine the force exerted by the reducing bend. [16]

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

II B.Tech I Semester Examinations,November 2010
FLUID MECHANICS
Civil Engineering

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

Answer any FIVE Questions
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   ii. Kinematic viscosity
   iii. Velocity gradient. [10+6]

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

II B.Tech I Semester Examinations,November 2010
FLUID MECHANICS
Civil Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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

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