Code No: R1621016 **R16** SET - 1

II B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019
FLUID MECHANICS
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Define specific volume and specific gravity? (2M)
   b) What do you understand by total pressure and centre of pressure? (2M)
   c) State Bernoulli's equation? Write the assumptions for such a derivation? (3M)
   d) What do you understand by turbulent flow? (2M)
   e) What is mean by orifice? Classify the types of orifices? (3M)
   f) Define displacement thickness? (2M)

PART -B

2. a) Define absolute, vacuum and gauge pressures? (6M)
   b) Explain about U-tube differential manometer and inverted U-tube differential manometer? (8M)

3. a) Explain about velocity potential function and steam function? (6M)
   b) Define the equation of continuity. Obtain the expression for continuity equation in three dimensions? (8M)

4. a) Define momentum equation and its applications? (6M)
   b) A 45^0 reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 600mm and 300mm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet to bend is $8.829 N/cm^2$ and rate of flow of water is 600litres/s. (8M)

5. The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300m, 170m, and 210m and of diameters 300mm, 200mm and 400mm respectively is 12m. Determine the rate of flow of water if co-efficient of friction are 0.005, 0.0052 and 0.0048 respectively. Considering: (i) minor losses (ii) neglecting minor losses. (14M)
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6. a) Determine the expression for rate of flow through the venturimeter? (7M)

   b) A horizontal venturimeter with inlet diameter 20cm and throat diameter 10cm is used to measure the flow of oil of sp.gr.0.8. The discharge of oil through venturimeter is 60lit/s. Find the reading of oil-mercury differential manometer. Take Cd=0.98 . (7M)

7. a) What are the different methods of preventing the separation of boundary layers? (6M)

   b) Define laminar boundary layer, turbulent boundary layer, laminar sub layer and boundary layer thickness? (7M)

Code No: R1621016 **R16** SET - 2

II B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019
FLUID MECHANICS
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Differentiate between surface tension and capillarity? (2M)
   b) Classify the types of fluid flows? (2M)
   c) Define mass momentum equation? (2M)
   d) Define total energy line and hydraulic gradient line? (3M)
   e) Explain about pitot-tube and its uses? (2M)
   f) Define the terms boundary layer, laminar boundary layer and turbulent boundary layer? (3M)

PART -B

2. a) Define absolute, vacuum and gauge pressures? (7M)
   b) Explain about differential manometers? (7M)
   (i)U-tube differential manometer
   (ii)Inverted U-tube differential manometer

3. a) Define velocity potential function and steam function? (6M)
   b) Define the equation of continuity. Obtain the expression for continuity equation in three dimensions? (8M)

4. a) State Bernoulli's equation? Write the assumptions for such a derivation? (6M)
   b) The water is flowing through a taper pipe of length 100m having diameters 600mm at the upper end and 300mm at the lower end at the rate of 50lit/s. The pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher level is 19.62N/cm^2. (8M)
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5. a) Derive an expression for loss of head due to sudden contraction? (7M)

   b) A horizontal pipe of diameter 500mm is suddenly contracted to a diameter of 250mm.The pressure intensities in the large and smaller pipe is given as 13.734N/cm^{2}and 11.772N/cm^2 respectively. Find the loss of head due to contraction if Cc=0.62. Also determine the rate of flow of water. (7M)

6. a) Derive an expression for discharge over a rectangular notch or weir? (7M)

   b) Find the discharge of water flowing over a rectangular notch of 2m length when the constant head over the notch is 300mm. Take Cd=0.60. (7M)

7. a) Define displacement thickness. Derive an expression for displacement thickness? (7M)

   b) What are the different methods of preventing the separation of boundary layers? (7M)

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2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Define dynamic viscosity and kinematic viscosity? (2M)
   b) Define rotational and irrotational flows? (2M)
   c) State Bernoulli's equation? Write the assumptions for such a derivation? (3M)
   d) What are the major losses and minor losses? (2M)
   e) Define orifice, notch and weir? (3M)
   f) Define displacement thickness? (2M)

PART -B

2. a) Define vapour pressure and cavitation? (7M)
   b) Differentiate between the following? (7M)
   (i)U-tube differential manometer
   (ii)Inverted U-tube differential manometer

3. a) Classify the types of fluid flows? Define each type of fluid flow? (7M)
   b) The diameters of a pipe at the sections 1 and 2 are 10cm and 15cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 is 5m/s. Determine also the velocity at section 2. (7M)

4. a) Define momentum equation and derive an expression for force exerted by a flowing fluid on a pipe bend? (7M)
   b) A 300 mm diameter pipe carries water under a head of 20 meters with a velocity of 3.5m/s. If the axis of pipe turns through 45^0, find the magnitude and direction of the resultant force at the bend. (7M)
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5. a) Determine the loss of head due to friction in pipes by using (i) Darcy formula (ii) Chezy's formula? (7M)

   b) Find the head lost due to friction in a pipe of diameter 300mm and length 50m, through which water is flowing at a velocity of 3m/s using (i) Darcy formula (ii) Chezy's formula for which C=60. (7M)

6. a) Determine the expression for rate of flow through the venture meter? (7M)

   b) A horizontal venture meter with inlet diameter 20cm and throat diameter 10cm is used to measure the flow of oil of sp.gr.0.8. The discharge of oil through venture meter is 60lit/s. Find the reading of oil-mercury differential manometer. Take C_d=0.98 . (7M)

7. a) Describe the terms boundary layer and boundary layer theory? (7M)

   b) Obtain an expression for the boundary shear stress in terms of momentum thickness. (7M)

Code No: R1621016 **R16** SET - 4

II B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019
FLUID MECHANICS
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A

1. a) Define mass density and weight density? (2M)
   b) What do you understand by total pressure and centre of pressure? (2M)
   c) Define momentum equation? (3M)
   d) Explain about Reynolds experiment? What are the major losses and minor losses? (2M)
   e) Define notch and weir? Classify the types of notches and weirs? (3M)
   f) Define the term boundary layer and boundary layer theory? (2M)

PART -B

2. a) Explain about bourdon tube pressure gauge? (7M)
   b) A simple u- tube manometer containing mercury is connected to a pipe in which a fluid of sp.gr.0.8 and having vacuum pressure is flowing. The other end of manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 40cm and the height of the fluid in the left from the centre of pipe is 15cm below. (7M)

3. a) Classify the types of fluid flows? Define each type of fluid flow? (7M)
   b) Derive an expression for depth of centre of pressure from free surface of liquid of an inclined plane surface sub-merged in the liquid? (7M)

4. a) Define mass momentum equation and its applications? (6M)
   b) 250 lit/s of water is flowing in a pipe having a diameter of 300mm. If the pipe is bent by 135^0 (that is change from initial to final direction is 135^0), find the magnitude and direction of the resultant force on the bend. The pressure of water flowing is $39.24 N/cm^2$. (8M)
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5. a) Derive an expression for loss of head due to sudden enlargement? (7M)

   b) A horizontal pipe of diameter 500 mm is suddenly contracted to a diameter of 250 mm. The pressure intensities in the large and smaller pipe is given as 13.734N/cm^2 and 11.772N/cm^2 respectively. Find the loss of head due to contraction if Cc=0.62. Also determine the rate of flow of water. (7M)

6. a) Derive an expression for discharge over a triangular notch or weir? (7M)

   b) Water flows over a rectangular weir 1m wide at a depth of 150mm and afterwards passes through a triangular right-angled weir. Taking C_d for the rectangular and triangular weir as 0.62 and 0.59 respectively, find the depth over the triangular weir. (7M)

7. a) What do you mean by separation of boundary layer? What is the effect of pressure gradient on boundary layer separation? (7M)

   b) What are the different methods of preventing the separation of boundary layers and explain any one of them? (7M)