Code No: RT21016 **R13** SET - 1

II B. Tech I Semester Regular Examinations, Dec - 2014
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 **THREE** Questions from **Part-B**

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PART-A

1. a) How does the viscosity of air vary with temperature?
   b) Differentiate between stream function and velocity potential.
   c) List the surface and body forces in fluid flow.
   d) Define boundary layer with a neat sketch.
   e) List Minor losses and explain briefly.
   f) Draw a neat sketch of pitot tube and explain its working. (4M+4M+4M+4M+3M+3M)

PART B

2. a) List all fluid properties and derive Newton's law of viscosity.
   b) Find the height through which water rises by capillary action in a glass tube of 2mm bore if the surface tension at the prevailing temperature is 0.075 N/m. (8M+8M)

3. a) Define stream function and velocity potential. What are their uses
   b) Determine whether the following velocity components satisfy the continuity equation.
   i) u = cx, v = -cy ii) u = -cx/y , v = c log xy (8M+8M)

4. a) What are the surface and body forces? State the Bernoulli's equation and discuss the significance of different terms.
   b) A pipe line tapers from 1.5 m in diameter at higher end to 1.0 m diameter at lower end in 400 m length at a slope of 1 in 100. The pressure at the higher end is 75 KPa. If the discharge is 60 m^3/minute, find the pressure at lower end. Neglect losses. (6M+10M)

5. a) Explain the development of boundary layer formation over a flat plate.
   b) Define drag and lift. Explain how boundary layer separates from the boundary (8M+8M)

6. a) What are hydraulic grade line and total energy line? How do you draw the same
   b) Two reservoirs with a difference in water surface elevations of 10m are connected by a pipe line ABC which consists of two pipes of AB and BC joined in series. Pipe AB is 10cm in diameter, 20m long and has a value of f =0.02. Pipe BC is of 16cm diameter, 25m long and has f=0.018. The junctions with the reservoirs and between the pipes are abrupt. Calculate the discharge considering all minor losses. (6M+10M)

7. a) A pipe carries a flow of an oil of Relative Density = 0.85. A pitot-static tube is inserted into the pipe to measure the velocity at a point M. If a differential mercury-oil gauge connected to the pitot-static tube indicates a reading of 4cm, calculate the velocity at M. Assume the coefficient of the pitot tube as 0.99.
   b) Compare the working of a venturimeter with orifice meter (10M+6M)
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Code No: RT21016 **R13** SET - 2

II B. Tech I Semester Regular Examinations, Dec - 2014
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 **THREE** Questions from **Part-B**

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PART-A

1. a) What are the applications of surface tension?
   b) What is a flow net? What are its uses?
   c) Explain any one application of momentum equation.
   d) What is Magnus Effect?
   e) Explain how Reynold's experiment is conducted.
   f) Draw a neat sketch of venturimeter and explain its parts. (4M+4M+4M+4M+3M+3M)

PART-B

2. a) Derive the equation for capillarity depression when a small glass tube is inserted in mercury.
   b) A piston of 7.95 cm diameter and 30 cm long works in a cylinder of 8.0 cm diameter. The annular space of the pistion is filled with an oil of viscosity 2 poise. If an axial load of 10N is applied to the piston, calculate the speed of movement of the piston. (6M+10M)

3. a) What is a centre of pressure? Derive the equation for the centre of pressure for a submerged plane surface in a fluid.
   b) A circular plate of diameter 0.75m is immersed in a liquid of relative density 0.80 with its plane making an angle of 30 degrees with the horizontal. The centre of the plate is at a depth of 1.50 m below the free surface. Calculate the total force on one side of the plate and the location of centre of pressure. (6M+10M)

4. a) State the Bernoulli's equation and discuss its significance.
   b) A Water pipe changes in diameter from 400mm at section A to 800mm at section B which is 7 m above. The pressures at A and B are 100 KPa and 75 KPa respectively. The discharge is 400 litres/sec. Find the direction of flow. (8M+8M)

5. a) What do you understand by Boundary Layer? Explain the development of Boundary layer over a flat plate.
   b) Define drag and lift. Explain how Boundary layer separation takes place (8M+8M)

6. a) Explain the Reynold's experiment to classify the flows.
   b) Derive Hazen Poiscille equation for laminar flow in circular pipe line (8M+8M)

7. a) A venturimeter is used for measuring the flow of petrol in a pipe line inclined at 35 degrees to horizontal. The specific gravity of the petrol is 0.81 and throat area ratio is 4. If the difference in mercury levels in the gauges is 50mm, calculate the flow if the pipe diameter is 0.3m. Take coefficient of discharge as 0.975.
   b) Explain the working of all the discharging measuring devices with required equations. (10M+6M)

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Code No: RT21016 **R13** SET - 3

II B. Tech I Semester Regular Examinations, Dec - 2014
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 **THREE** Questions from **Part-B**

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PART-A

1. a) Derive the equation for capillary rise in a small tube dipped in a liquid
b) Explain the concept of stream tube in fluid mechanics.
c) Discuss any one application of Bernoulli's equation.
d) Explain Boundary layer separation with a neat sketch.
e) Explain TEL and HGL.
f) What are notches? Explain any one notch with a neat sketch. (4M+4M+4M+4M+3M+3M)

PART-B

2. a) What is the significance of viscosity and surface tension in fluid flow phenomenon? Explain in detail with required equations.
b) What are the modes of measuring pressure? How can you convert the pressure in KPa into the liquid columns and vice-versa? (8M+8M)

3. a) Derive the equation for centre of force for a circular plane area immersed in a fluid
b) Find the absolute pressure at a depth of 5m below the surface of a liquid of relative density 0.85. The barometer reading on the surface is 750 mm of mercury. (8M+8M)

4. a) What are energy correction and momentum correction factors?
b) A pipe line 300 m long has a slope of 1 in 100 and tapers from 1.2m diameter at the high end to 0.6m at the low end. The discharge through the pipe is 5.4 m^3/minute. If the pressure at the high end is 70 KPa, find the pressure at the low end. Neglect losses. (6M+10M)

5. a) What are the characteristics of boundary layer formation over a flat plate?
b) Define drag and lift. Discuss the boundary layer separation. (8M+8M)

6. a) What do you mean by pipe in series and pipes in parallel?
b) A reservoir discharges water into the atmosphere through a compound horizontal pipe line ABC. The compound pipe consists of two pipes as noted below. A is junction point with the reservoir. AB : Diameter = 10cm , length =25m, f = 0.02
BC : Diameter = 12cm , length = 35m, f= 0.02
The water level in the tank is 10m above the centre line of the pipe. Calculate the discharge considering all the minor losses. (6M+10M)

7. a) A pipe carries a flow of an oil of Relative Density = 0.85. A pitot-static tube is inserted into the pipe to measure the velocity at a point M. If a differential mercury-oil gauge connected to the pitot-static tube indicates a reading of 4cm, calculate the velocity at M. Assume the coefficient of the pitot tube as 0.99.
b) Explain the working of orifice meter with neat sketches. (10M+6M)
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Code No: RT21016 **R13** SET - 4

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FLUID MECHANICS
(Civil Engineering)

Time: 3 hours Max. Marks: 70

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

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PART-A

1. a) What is pascal's law? Explain with an example.
   b) What is centre of pressure? Where does it lie in relation to centre of gravity?
   c) How do you find force acting on a pipe bend?
   d) Discuss Navier Stokes equation
   e) What is the significance of Reynold's experiment?
   f) Explain the working of Cippoletti notch. (4M+4M+4M+4M+3M+3M)

PART-B

2. a) List all the fluid properties and explain why water rises in a small glass tube when inserted in water.
   b) The space between two parallel plates kept 3mm apart is filled with an oil of dynamic viscosity 0.2 Pa.s. What is the shear stress on the lower fixed plate, if the upper one is moved with a velocity of 1.50m/sec? (6M+10M)

3. a) What are different types of flows? Explain in detail
   b) Derive the equation of continuity in three dimension form. (8M+8M)

4. a) Derive the Bernoulli's equation from Euler's equation. State the assumptions made.
   b) Define and derive equation for energy correction factor. (8M+8M)

5. a) What is a boundary layer? Differentiate between a laminar and turbulent boundary layer.
   b) Explain how a boundary layer separates from boundary. What are the conditions under which separation takes place ? (8M+8M)

6. a) List out the minor losses in closed conduit flow and discuss their significance
   b) A 6 cm diameter pipe has a discharge of 450 l/min. At a section the pipe has a sudden expansion to a size of 9 cm diameter. If the pressure just upstream of the expansion is 20 KN/ m^2, calculate the pressure just after the expansion. Assume the pipe to be horizontal. (6M+10M)

7. a) What are the different flow measuring devices? Explain any one of them neatly and clearly.
   b) Gasoline of specific of gravity 0.82 flows at a rate of 215 litres per second, upwards in an inclined venturimeter fitted to a 300mm diameter pipe. The venturimeter is inclined at 60 degrees to the vertical and its 150mm diameter throat is 1.2m from the entrance along its length. The pressure gauges inserted at entrance and throat show pressures of 0.141 N/mm^2 and 0.077 N/mm^2 respectively. Calculate the coefficient of discharge. (6M+10M)
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