Code No: RR210801 | RR | SET-1

B.Tech II Year - I Semester Examinations, May-June, 2012
FLUID MECHANICS
(CHEMICAL ENGINEERING)

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

Answer any five questions
All questions carry equal marks

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1.a) Explain briefly the following terms:
i) Mass density ii) Weight density
(iii) Specific volume iv) Specific gravity.

b) A plate has an area of 1 m^2. It slides down an inclined plane, having angle of inclination 45° to the horizontal, with a velocity of 0.5 m/s. The thickness of oil film between the plane and the plate is 1 mm. Find the viscosity of the fluid if the weight of the plate is 70.72 N. [16]

2.a) Derive an expression for the depth of centre of pressure from free surface of liquid of an inclined plane surface submerged in the liquid.

b) A circular plate of diameter 1.5 m is placed vertically in water in such a way that the centre of the plate is 3 m below the free surface of water. Determine:
i) Total pressure on the plate, and
ii) Position of the centre of pressure. [16]

3.a) Define and explain the following:
i) Velocity potential ii) Stream function.

b) Determine whether the continuity equation is satisfied by the following velocity components for an incompressible fluid.
$u=x^2y$, $v=2xy-xy^2$, $w=x^2-z^2$ [16]

4.a) Discuss the following heads:
i) Potential Head ii) Velocity Head iii) Datum Head.

b) A pipe (1) 400 mm in diameter, convering water, branches into two pipes (2) and (3) of diameters 300 mm and 200 mm respectively.
i) Find the discharge in pipe (1) if the average velocity of water in this pipe is 3 m/s.
ii) Determine the velocity of water in 200 mm pipe, if the average velocity in 300 mm diameter pipe is 2 m/s. [16]

5.a) Define boundary layer and explain the fundamental causes of its existence.

b) Show that for velocity distribution,

$$\frac{u}{U}=2\left(\frac{y}{\delta}\right)-\left(\frac{y}{\delta}\right)^2$$

the ratio of $\delta/\delta^*=3$. [16]

6.a) Explain the following
i) Hydraulic gradient line (H.G.L.)
ii) Energy gradient line (E.G.L.)

b) A horizontal pipe carries water at a rate of 0.03 m^3/s. Its diameter reduces abruptly from 150 mm to 100 mm. If the co-efficient of friction is 0.6 find the pressure loss across the contraction. [16]

7. Describe an orificemeter and find an expression for measuring discharge of fluid through a pipe with this device. [16]

8.a) Prove that the error in discharge due to error in the measurement of head over a triangular notch is given by

$$\frac{dQ}{Q} = \frac{5}{2}\frac{dH}{H}$$

where, Q = Discharge through the triangular notch, and
H = Head over the triangular notch.

b) Find the discharge of water flowing over a rectangular notch of 2.5 m length when the constant head over the notch is 400 mm. Take C_d =0.62. [16]

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Code No: RR210801 | RR | SET-2

B.Tech II Year - I Semester Examinations, May-June, 2012
FLUID MECHANICS
(CHEMICAL ENGINEERING)

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

Answer any five questions
All questions carry equal marks

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1.a) Define and explain the following:
i) Velocity potential ii) Stream function.
b) Determine whether the continuity equation is satisfied by the following velocity components for an incompressible fluid.
$u=x^2y$, $v=2xy-xy^2$, $w=x^2-z^2$ [16]

2.a) Discuss the following heads:
i) Potential Head ii) Velocity Head iii) Datum Head.
b) A pipe (1) 400 mm in diameter, converying water, branches into two pipes (2) and (3) of diameters 300 mm and 200 mm respectively.
i) Find the discharge in pipe (1) if the average velocity of water in this pipe is 3 m/s.
ii) Determine the velocity of water in 200 mm pipe, if the average velocity in 300 mm diameter pipe is 2 m/s. [16]

3.a) Define boundary layer and explain the fundamental causes of its existence.
b) Show that for velocity distribution,

$$\frac{u}{U}=2\left(\frac{y}{\delta}\right)-\left(\frac{y}{\delta}\right)^2$$

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4.a) Explain the following
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b) A horizontal pipe carries water at a rate of 0.03 m^3/s. Its diameter reduces abruptly from 150 mm to 100 mm. If the co-efficient of friction is 0.6 find the pressure loss across the contraction. [16]

5. Describe an orificemeter and find an expression for measuring discharge of fluid through a pipe with this device. [16]

6.a) Prove that the error in discharge due to error in the measurement of head over a triangular notch is given by

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where, Q = Discharge through the triangular notch, and
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b) Find the discharge of water flowing over a rectangular notch of 2.5 m length when the constant head over the notch is 400 mm. Take C_d =0.62. [16]

7.a) Explain briefly the following terms:
i) Mass density ii) Weight density
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b) A plate has an area of 1 m^2. It slides down an inclined plane, having angle of inclination 45° to the horizontal, with a velocity of 0.5 m/s. The thickness of oil film between the plane and the plate is 1 mm. Find the viscosity of the fluid if the weight of the plate is 70.72 N. [16]

8.a) Derive an expression for the depth of centre of pressure from free surface of liquid of an inclined plane surface submerged in the liquid.

b) A circular plate of diameter 1.5 m is placed vertically in water in such a way that the centre of the plate is 3 m below the free surface of water. Determine:
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Code No: RR210801 | RR | SET-3

B.Tech II Year - I Semester Examinations, May-June, 2012
FLUID MECHANICS
(CHEMICAL ENGINEERING)

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

Answer any five questions
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1.a) Define boundary layer and explain the fundamental causes of its existence.

b) Show that for velocity distribution,

$$\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$$

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2.a) Explain the following
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b) A horizontal pipe carries water at a rate of 0.03 m^3/s. Its diameter reduces abruptly from 150 mm to 100 mm. If the co-efficient of friction is 0.6 find the pressure loss across the contraction. [16]

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where, Q = Discharge through the triangular notch, and
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b) Find the discharge of water flowing over a rectangular notch of 2.5 m length when the constant head over the notch is 400 mm. Take $C_d = 0.62$. [16]

5.a) Explain briefly the following terms:
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b) Determine whether the continuity equation is satisfied by the following velocity components for an incompressible fluid.

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i) Find the discharge in pipe (1) if the average velocity of water in this pipe is 3 m/s.

ii) Determine the velocity of water in 200 mm pipe, if the average velocity in 300 mm diameter pipe is 2 m/s. [16]

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Code No: RR210801 | RR | SET-4

B.Tech II Year - I Semester Examinations, May-June, 2012
FLUID MECHANICS
(CHEMICAL ENGINEERING)

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

Answer any five questions
All questions carry equal marks
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1. Describe an orificemeter and find an expression for measuring discharge of fluid through a pipe with this device. [16]

2.a) Prove that the error in discharge due to error in the measurement of head over a triangular notch is given by

$$\frac{dQ}{Q} = \frac{5}{2}\frac{dH}{H}$$

where, Q = Discharge through the triangular notch, and
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b) Find the discharge of water flowing over a rectangular notch of 2.5 m length when the constant head over the notch is 400 mm. Take C_d =0.62. [16]

3.a) Explain briefly the following terms:
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b) A plate has an area of 1 m^2. It slides down an inclined plane, having angle of inclination 45° to the horizontal, with a velocity of 0.5 m/s. The thickness of oil film between the plane and the plate is 1 mm. Find the viscosity of the fluid if the weight of the plate is 70.72 N. [16]

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