www.firstranker.com

Code No: 07A30801 **R07** **Set No. 2**

II B.Tech I Semester Examinations,November 2010
MOMENTUM TRANSFER
Chemical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. A lube oil(specific gravity 0.8) is flowing through a 15 cm steel pipe at 1500 LPM. A 10 cm orifice attached to a mercury manometer is placed in the pipe line and the orifice coefficient may be taken as 0.62. If the manometer leg is inclined at an angle of 30^0 to the horizontal, what would be the manometer reading along the sloping leg? [16]

2. (a) Explain Diaphragm pump.
   (b) Describe the working of reciprocating pump. [6+10]

3. Show that the maximum fluid velocity attainable for flow through a pipe of uniform cross section is equal to the sonic velocity. [16]

4. write short notes on:
   (a) Velocity gradient and Rate of shear
   (b) Discussion of Bernoulli's equation & correction for effects of solid boundaries. [8+8]

FIRSTRANKER

5. A concentrated suspension of spherical quartz particles in water settles under gravity. Particle diameter and density are 0.01 mm and 2650 kg/m^3, respectively. Initial voidage in the suspension is 0.8. Assuming the validity of Stokes law, find the initial settling velocity of the particles given that $U_S = U_t\varepsilon^{4.6}$. [16]

6. Check the dimensional consistency of the following empirical equation for a heat transfer coefficient, $h_i^{0.8}=0.023\,G\,k^{0.67}c_p^{0.33}D^{-0.2}\mu^{-0.47}$ h_i = Heat transfer coefficient, G = Mass velocity, k = Thermal conductivity, c_p = Specific heat , D = diameter, μ = Absolute viscosity. [16]

7. (a) Give the merits and demerits of fluidization.
   (b) A spherical bead catalyst of diameter 4.4 mm is to be fluidized with water at 21 ^{0}C in a 0.1524m diameter column. The catalyst has a density of 1600 Kg/m^3. The originally unexpanded column height was 0.712m and the voidage associated with these was ε= 0.37. Find the height of expanded bed when the solids are subjected to an upward water rate of 0.1243 m/s and the voidage is 0.775. [8+8]

8. (a) Define 'Equivalent diameter' for fluid flow through ducts of noncircular diameter.

www.firstranker.com

www.firstranker.com

(b) Calculate the hydraulic mean diameter of the annular space between a 4 cm and 6 cm tubes.

(c) Draw velocity profile for laminar flow in a circular pipe. [5+5+6]

⋆⋆⋆⋆⋆

FIRSTRANKER

www.firstranker.com

www.firstranker.com

Code No: 07A30801 **R07** **Set No. 4**

II B.Tech I Semester Examinations,November 2010
MOMENTUM TRANSFER
Chemical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks
⋆⋆⋆⋆⋆

1. write short notes on:
   (a) Velocity gradient and Rate of shear
   (b) Discussion of Bernoulli's equation & correction for effects of solid boundaries. [8+8]

2. A concentrated suspension of spherical quartz particles in water settles under gravity. Particle diameter and density are 0.01 mm and 2650 kg/m^3, respectively. Initial voidage in the suspension is 0.8. Assuming the validity of Stokes law, find the initial settling velocity of the particles given that $U_S = U_t\varepsilon^{4.6}$. [16]

3. (a) Define 'Equivalent diameter' for fluid flow through ducts of noncircular diameter.
   (b) Calculate the hydraulic mean diameter of the annular space between a 4 cm and 6 cm tubes.
   (c) Draw velocity profile for laminar flow in a circular pipe. [5+5+6]

4. (a) Explain Diaphragm pump.
   (b) Describe the working of reciprocating pump. [6+10]

5. A lube oil(specific gravity 0.8) is flowing through a 15 cm steel pipe at 1500 LPM. A 10 cm orifice attached to a mercury manometer is placed in the pipe line and the orifice coefficient may be taken as 0.62. If the manometer leg is inclined at an angle of 30^0 to the horizontal, what would be the manometer reading along the sloping leg? [16]

6. (a) Give the merits and demerits of fluidization.
   (b) A spherical bead catalyst of diameter 4.4 mm is to be fluidized with water at 21 ^{0}C in a 0.1524m diameter column. The catalyst has a density of 1600 Kg/m^3. The originally unexpanded column height was 0.712m and the voidage associated with these was ε= 0.37. Find the height of expanded bed when the solids are subjected to an upward water rate of 0.1243 m/s and the voidage is 0.775. [8+8]

7. Show that the maximum fluid velocity attainable for flow through a pipe of uniform cross section is equal to the sonic velocity. [16]

www.firstranker.com

www.firstranker.com

8. Check the dimensional consistency of the following empirical equation for a heat transfer coefficient, $h_i^{0.8}$=0.023 G $k^{0.67} c_p^{0.33} D^{-0.2} \mu^{-0.47}$ h_i = Heat transfer coefficient, G = Mass velocity, k = Thermal conductivity, c_p = Specific heat , D = diameter, μ = Absolute viscosity. [16]

⋆⋆⋆⋆⋆

FIRSTRANKER

www.firstranker.com

www.firstranker.com

Code No: 07A30801 **R07** **Set No. 1**

II B.Tech I Semester Examinations,November 2010
MOMENTUM TRANSFER
Chemical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Check the dimensional consistency of the following empirical equation for a heat transfer coefficient, $h_i^{0.8} = 0.023\ G\ k^{0.67} c_p^{0.33} D^{-0.2} \mu^{-0.47}$ h_i = Heat transfer coefficient, G = Mass velocity, k = Thermal conductivity, c_p = Specific heat , D = diameter, μ = Absolute viscosity. [16]

2. (a) Explain Diaphragnu pump.
   (b) Describe the working of reciprocating pump. [6+10]

3. A lube oil(specific gravity 0.8) is flowing through a 15 cm steel pipe at 1500 LPM. A 10 cm orifice attached to a mercury manometer is placed in the pipe line and the orifice coefficient may be taken as 0.62. If the manometer leg is inclined at an angle of 30^0 to the horizontal, what would be the manometer reading along the sloping leg? [16]

4. Show that the maximum fluid velocity attainable for flow through a pipe of uniform cross section is equal to the sonic velocity. [16]

5. write short notes on:
   (a) Velocity gradient and Rate of shear
   (b) Discussion of Bernoulli's equation & correction for effects of solid boundaries. [8+8]

FIRSTRANKER

6. A concentrated suspension of spherical quartz particles in water settles under gravity. Particle diameter and density are 0.01 mm and 2650 kg/m^3, respectively. Initial voidage in the suspension is 0.8. Assuming the validity of Stokes law, find the initial settling velocity of the particles given that $U_S = U_t \varepsilon^{4.6}$. [16]

7. (a) Define 'Equivalent diameter' for fluid flow through ducts of noncircular diameter.
   (b) Calculate the hydraulic mean diameter of the annular space between a 4 cm and 6 cm tubes.
   (c) Draw velocity profile for laminar flow in a circular pipe. [5+5+6]

8. (a) Give the merits and demerits of fluidization.
   (b) A spherical bead catalyst of diameter 4.4 mm is to be fluidized with water at 21 ^{0}C in a 0.1524m diameter column. The catalyst has a density of 1600 Kg/m^3. The originally unexpanded column height was 0.712m and the voidage

www.firstranker.com

www.firstranker.com

associated with these was $\varepsilon = 0.37$. Find the height of expanded bed when the solids are subjected to an upward water rate of 0.1243 m/s and the voidage is 0.775. [8+8]

⋆ ⋆ ⋆ ⋆ ⋆

FIRSTRANKER

www.firstranker.com

www.firstranker.com

Code No: 07A30801 **R07** **Set No. 3**

II B.Tech I Semester Examinations,November 2010
MOMENTUM TRANSFER
Chemical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆⋆⋆⋆⋆

1. Show that the maximum fluid velocity attainable for flow through a pipe of uniform cross section is equal to the sonic velocity. [16]

2. A lube oil(specific gravity 0.8) is flowing through a 15 cm steel pipe at 1500 LPM. A 10 cm orifice attached to a mercury manometer is placed in the pipe line and the orifice coefficient may be taken as 0.62. If the manometer leg is inclined at an angle of 30^0 to the horizontal, what would be the manometer reading along the sloping leg? [16]

3. A concentrated suspension of spherical quartz particles in water settles under gravity. Particle diameter and density are 0.01 mm and 2650 kg/m^3, respectively. Initial voidage in the suspension is 0.8. Assuming the validity of Stokes law, find the initial settling velocity of the particles given that $U_S = U_t \varepsilon^{4.6}$. [16]

4. (a) Define 'Equivalent diameter' for fluid flow through ducts of noncircular diameter.
   (b) Calculate the hydraulic mean diameter of the annular space between a 4 cm and 6 cm tubes.
   (c) Draw velocity profile for laminar flow in a circular pipe. [5+5+6]

5. Check the dimensional consistency of the following empirical equation for a heat transfer coefficient, $h_i^{0.8}$=0.023 G $k^{0.67} c_p^{0.33} D^{-0.2} \mu^{-0.47}$ h_i = Heat transfer coefficient, G = Mass velocity, k = Thermal conductivity, c_p = Specific heat , D = diameter, μ = Absolute viscosity. [16]

6. (a) Explain Diaphragm pump.
   (b) Describe the working of reciprocating pump. [6+10]

7. write short notes on:
   (a) Velocity gradient and Rate of shear
   (b) Discussion of Bernoulli's equation & correction for effects of solid boundaries. [8+8]

8. (a) Give the merits and demerits of fluidization.
   (b) A spherical bead catalyst of diameter 4.4 mm is to be fluidized with water at 21 ^{0}C in a 0.1524m diameter column. The catalyst has a density of 1600 Kg/m^3. The originally unexpanded column height was 0.712m and the voidage

www.firstranker.com

www.firstranker.com

associated with these was $\varepsilon = 0.37$. Find the height of expanded bed when the solids are subjected to an upward water rate of 0.1243 m/s and the voidage is 0.775. [8+8]

⋆ ⋆ ⋆ ⋆ ⋆

FIRSTRANKER

www.firstranker.com