Code No: R07A12301　　　　　　　**R07**　　　　　　**Set No. 2**

**I B.Tech Examinations,December 2010**
**PROCESS ENGINEERING PRINCIPLES**
**Bio-Technology**

Time: 3 hours　　　　　　　　　　　　　　　　　　　　**Max Marks: 80**
**Answer any FIVE Questions**
**All Questions carry equal marks**
⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Explain the following terms as they are applied to a centrifugal pump
    i. static suction lift
    ii. static suction head
    iii. static discharge head
    iv. total static head.
   (b) Describe the working principle of any one type of rotary pump with a neat
       sketch.　　　　　　　　　　　　　　　　　　　　　　　　　　　　[8+8]

2. (a) Explain the purpose of using a non return valve in the suction pipe of a
       centrifugal pump.
   (b) Discuss about the important flow meters used in industry. What are the
       advantages and disadvantages over each other?
   (c) What is the use of foot valve and strainer in centrifugal pump?　　[6+8+2]

3. (a) Explain the development of boundary layer in a flat plate.
   (b) Distinguish between laminar and turbulent flow.　　　　　　　　[10+6]

4. (a) If the velocity distribution of a fluid over a plate is given by u=(3/4)y-y$^2$ where
       u is the velocity in metre per sec at a distance of y meters above the plate,
       determine the shears stress at y=0.15 meters.
       Take the dynamic viscosity of the fluid as $8.5 \times 10^{-5}$ kg-sec/m.
   (b) Classify the types of fluid.　　　　　　　　　　　　　　　　　[8+8]

5. Write short notes on:
   (a) Specific cake resistance
   (b) Equivalent cake thickness
   (c) Filter aid
   (d) Factors that effect the filtration rate.　　　　　　　　　　[4+4+4+4]

6. (a) Acetylene gas is formed according to the equation:
       $CaC_2 + 2H_2O - - - - - > C_2H_2 + Ca(OH)_2$
       Calculate the number of hours of service that can be derived from 1.0 kg of
       carbide in an acetylene lamp burning 60 liter of gas per hour at 30$^0$C and a
       pressure of 725 mm Hg. Assume ideal gas law.

1

(b) A solution of NaCl in water contains 300 gm of NaCl per liter at $30^0$C. The density of solution at $30^0$C is 1.152 gms/cm$^3$, calculate the following:

    i. Volumetric percent of water.

    ii. Composition in mole percent. [8+8]

7. (a) Define Fanning friction factor and Darcy's friction factor

  (b) Define equivalent diameter

  (c) Blassius law for friction factor

  (d) Write short notes on friction factor charts. [4+4+4+4]

8. (a) Water at 60$^o$C is pumped from a reservoir to the top of a mountain through a 15 cm pipe at a velocity of 3.5 m/s. The pipe discharges into the atmosphere at a level of 1000 m above the level in the reservoir. The pipe itself is 1500 m long. If the overall efficiency of the pipe is 65 %. Calculate the power requirement?

  (b) Explain the concept of hydrostatic pressure. [12+4]

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Code No: **R07A12301**  | **R07** |  | **Set No. 4** |

**I B.Tech Examinations,December 2010**
**PROCESS ENGINEERING PRINCIPLES**
**Bio-Technology**

Time: 3 hours                                                                        Max Marks: 80

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

1. (a) Explain the purpose of using a non return valve in the suction pipe of a centrifugal pump.

   (b) Discuss about the important flow meters used in industry. What are the advantages and disadvantages over each other?

   (c) What is the use of foot valve and strainer in centrifugal pump?        [6+8+2]

2. (a) Explain the following terms as they are applied to a centrifugal pump
   
       i. static suction lift
   
       ii. static suction head
   
       iii. static discharge head
   
       iv. total static head.

   (b) Describe the working principle of any one type of rotary pump with a neat sketch.                                                                       [8+8]

3. (a) Explain the development of boundary layer in a flat plate.

   (b) Distinguish between laminar and turbulent flow.                        [10+6]

4. (a) If the velocity distribution of a fluid over a plate is given by u=(3/4)y-y² where u is the velocity in metre per sec at a distance of y meters above the plate, determine the shears stress at y=0.15 meters.
   Take the dynamic viscosity of the fluid as $8.5 \times 10^{-5}$ kg-sec/m.

   (b) Classify the types of fluid.                                           [8+8]

5. Write short notes on:

   (a) Specific cake resistance

   (b) Equivalent cake thickness

   (c) Filter aid

   (d) Factors that effect the filtration rate.                              [4+4+4+4]

6. (a) Acetylene gas is formed according to the equation:
   $CaC_2 + 2H_2O ----- > C_2H_2 + Ca(OH)_2$
   Calculate the number of hours of service that can be derived from 1.0 kg of carbide in an acetylene lamp burning 60 liter of gas per hour at $30^0$C and a pressure of 725 mm Hg. Assume ideal gas law.

3

(b) A solution of NaCl in water contains 300 gm of NaCl per liter at $30^0$C. The density of solution at $30^0$C is 1.152 gms/cm$^3$, calculate the following:

   i. Volumetric percent of water.

   ii. Composition in mole percent. [8+8]

7. (a) Water at $60^o$C is pumped from a reservoir to the top of a mountain through a 15 cm pipe at a velocity of 3.5 m/s. The pipe discharges into the atmosphere at a level of 1000 m above the level in the reservoir. The pipe itself is 1500 m long. If the overall efficiency of the pipe is 65 %. Calculate the power requirement?

(b) Explain the concept of hydrostatic pressure. [12+4]

8. (a) Define Fanning friction factor and Darcy's friction factor

(b) Define equivalent diameter

(c) Blassius law for friction factor

(d) Write short notes on friction factor charts. [4+4+4+4]

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Code No: R07A12301　　　　　　　| **R07** |　　　| **Set No. 1** |

**I B.Tech Examinations,December 2010**
**PROCESS ENGINEERING PRINCIPLES**
**Bio-Technology**

Time: 3 hours　　　　　　　　　　　　　　　　　　　　　　Max Marks: 80

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

1. (a) Explain the development of boundary layer in a flat plate.
   (b) Distinguish between laminar and turbulent flow.　　　　　　[10+6]

2. (a) Explain the purpose of using a non return valve in the suction pipe of a centrifugal pump.
   (b) Discuss about the important flow meters used in industry. What are the advantages and disadvantages over each other?
   (c) What is the use of foot valve and strainer in centrifugal pump?　　[6+8+2]

3. Write short notes on:
   (a) Specific cake resistance
   (b) Equivalent cake thickness
   (c) Filter aid
   (d) Factors that effect the filtration rate.　　　　　　　　　　[4+4+4+4]

4. (a) Define Fanning friction factor and Darcy's friction factor
   (b) Define equivalent diameter
   (c) Blassius law for friction factor
   (d) Write short notes on friction factor charts.　　　　　　　　[4+4+4+4]

5. (a) If the velocity distribution of a fluid over a plate is given by u=(3/4)y-y$^2$ where u is the velocity in metre per sec at a distance of y meters above the plate, determine the shears stress at y=0.15 meters.
   Take the dynamic viscosity of the fluid as $8.5 \times 10^{-5}$ kg-sec/m.
   (b) Classify the types of fluid.　　　　　　　　　　　　　　[8+8]

6. (a) Water at 60$^o$C is pumped from a reservoir to the top of a mountain through a 15 cm pipe at a velocity of 3.5 m/s. The pipe discharges into the atmosphere at a level of 1000 m above the level in the reservoir. The pipe itself is 1500 m long. If the overall efficiency of the pipe is 65 %. Calculate the power requirement?
   (b) Explain the concept of hydrostatic pressure.　　　　　　　　[12+4]

7. (a) Explain the following terms as they are applied to a centrifugal pump

      i. static suction lift

      ii. static suction head

     iii. static discharge head

     iv. total static head.

(b) Describe the working principle of any one type of rotary pump with a neat sketch. [8+8]

8. (a) Acetylene gas is formed according to the equation:
$CaC_2 + 2H_2O ----- > C_2H_2 + Ca(OH)_2$
Calculate the number of hours of service that can be derived from 1.0 kg of carbide in an acetylene lamp burning 60 liter of gas per hour at $30^0$C and a pressure of 725 mm Hg. Assume ideal gas law.

(b) A solution of NaCl in water contains 300 gm of NaCl per liter at $30^0$C. The density of solution at $30^0$C is 1.152 gms/cm$^3$, calculate the following:

     i. Volumetric percent of water.

     ii. Composition in mole percent. [8+8]

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Code No: R07A12301　　　　　　　| R07 |　　　　　| Set No. 3 |

**I B.Tech Examinations,December 2010**
**PROCESS ENGINEERING PRINCIPLES**
**Bio-Technology**

Time: 3 hours　　　　　　　　　　　　　　　　　　Max Marks: 80

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

1. (a) Water at $60^oC$ is pumped from a reservoir to the top of a mountain through a 15 cm pipe at a velocity of 3.5 m/s. The pipe discharges into the atmosphere at a level of 1000 m above the level in the reservoir. The pipe itself is 1500 m long. If the overall efficiency of the pipe is 65 %. Calculate the power requirement?

    (b) Explain the concept of hydrostatic pressure.　　　　　　　　　[12+4]

2. (a) Define Fanning friction factor and Darcy's friction factor

    (b) Define equivalent diameter

    (c) Blassius law for friction factor

    (d) Write short notes on friction factor charts.　　　　　　　　[4+4+4+4]

3. Write short notes on:

    (a) Specific cake resistance

    (b) Equivalent cake thickness

    (c) Filter aid

    (d) Factors that effect the filtration rate.　　　　　　　　　　[4+4+4+4]

4. (a) Explain the following terms as they are applied to a centrifugal pump

    i. static suction lift
    ii. static suction head
    iii. static discharge head
    iv. total static head.

    (b) Describe the working principle of any one type of rotary pump with a neat sketch.　　　　　　　　　　　　　　　　　　　　　[8+8]

5. (a) Acetylene gas is formed according to the equation:
    $CaC_2 + 2H_2O ----- > C_2H_2 + Ca(OH)_2$
    Calculate the number of hours of service that can be derived from 1.0 kg of carbide in an acetylene lamp burning 60 liter of gas per hour at $30^0C$ and a pressure of 725 mm Hg. Assume ideal gas law.

    (b) A solution of NaCl in water contains 300 gm of NaCl per liter at $30^0C$. The density of solution at $30^0C$ is 1.152 gms/cm$^3$, calculate the following:

    i. Volumetric percent of water.

7

ii. Composition in mole percent. [8+8]

6. (a) If the velocity distribution of a fluid over a plate is given by u=(3/4)y-y$^2$ where u is the velocity in metre per sec at a distance of y meters above the plate, determine the shears stress at y=0.15 meters.
Take the dynamic viscosity of the fluid as $8.5 \times 10^{-5}$ kg-sec/m.

(b) Classify the types of fluid. [8+8]

7. (a) Explain the development of boundary layer in a flat plate.

(b) Distinguish between laminar and turbulent flow. [10+6]

8. (a) Explain the purpose of using a non return valve in the suction pipe of a centrifugal pump.

(b) Discuss about the important flow meters used in industry. What are the advantages and disadvantages over each other?

(c) What is the use of foot valve and strainer in centrifugal pump? [6+8+2]

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