(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0650   Roll No. | | | | | | | | | | |

B.Tech.

(SEMESTER-III) THEORY EXAMINATION, 2012-13

FLUID FLOW AND SOLID HANDLING

Time : 2 Hours]   *[Total Marks : 50*

Section – A

1. Attempt **all** question parts : $5 \times 2 = 10$

    (a) What are the classifications of power driven machines ?

    (b) How fluid flow is achieved through filter ?

    (c) Filtration is a more efficient method for the separation of mixtures than decantation. Justify.

    (d) Give the equation for Angular Deformation.

    (e) Generically define a pump and a blower.

Section – B

2. Attempt any **three** question parts : $5 \times 3 = 15$

    (a) Sketch Gyratory crusher and explain it in detail.

    (b) Explain the classification of Cake Filters in detail.

    (c) (i) Estimate the Reynolds number for flow in an automobile exhaust pipe if the 2-L engine is operating at 3000 rpm.

        (ii) If the catalytic converter has four times the cross section of the exhaust pipe, how small must the channels in the converter be to get laminar flow ?

    (d) Classify the various types of flow meters and with a help of neat sketch discuss the working principle of a venturimeter for flow measurement.

Section – C

Attempt **all** questions.   **5 × 5 = 25**

3.   Attempt any **two** parts :

   (a)   Discuss the principle and working of Belt conveyor with the help of neat sketch.

   (b)   Describe the working of Rotameter and obtain the expression for flow rate of a liquid.

   (c)   Derive Bernoulli's equation applies momentum balance approach. Also discuss the limitations of Bernoulli's equation.

4.   Attempt any **one** part :

   (a)   Water is flowing through a pipe of diameter 30 cm and length 60 m connected to the base of the tank. The water level in the tank is 5 cm above the centre line of pipe. The friction factor f = 0.006. Density of water 1000 kg/m^3 and viscosity of water is 1 mN-S/m^2, Determine the volumetric flow of the water.

   (b)   Give the comparison of ideal and actual screens.

5.   Attempt any **one** part.

   (a)   (i)   Write the name of any two unit operations commonly used in chemical industry.

         (ii)   What is Sphericity ?

         (iii)   When nothing such as ideal fluid exists, what is the utility of studying flow of ideal fluids ?

         (iv)   What do you mean by vacuum pressure ?

         (v)   Give the physical significance of Reynold's number.

   (b)   A rotary vacuum filter is used to filter an aqueous slurry of $CaCO_3$ containing 236 kg of solids per m^3 water (density of water = 1000 kg/m^3). If the filter cake contains 50 percent moisture (wet basis). Calculate the quantity of solids deposited in the filter per unit volume of filtrate in kg/m^3.

6. Attempt any **one** part :

   (a) Describe the working of reciprocating pump and obtain an expression for the work done by a pump.

   (b) Explain in detail about the working principle of Nozzle and venturi meters.

7. Attempt any **two** parts.

   (a) Derive an expression for Minimum Fluidization Velocity.

   (b) Brief notes on Bubbling fluidization.

   (c) A partial oxidation is carried out by passing air with 1.2 mole percent hydrocarbon through 40-mm tubes packed with 2 m of 3-by-3-mm cylindrical catalyst pellets. The air enters at 350 °C and 2.0 atm with a superficial velocity of 1 m/s. What is the pressure drop through the packed tubes ? How much would the pressure drop be reduced by using 4-mm pellets ? Assume $\Box$ = 0.40.

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