53 (FPT 702) FPED

2017

FOOD PROCESS EQUIPMENT DESIGN

Paper : FPT 702

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* Write short notes on the sizing of food processing equipment. 4

(b) Discuss about the corrosion resistance of materials in the food processing equipment design. 5

(c) Discuss about the properties of stainless steel in the construction of food processing equipment. 6

(d) Detail *any one* of the stress which has to be considered in the fabrication of food equipment. 5

2. *(a)* Write in detail about the construction characteristic which has to be considered in the selection of food equipment. 10

(b) Explain the working mechanism of pneumatic conveyors with proper schematics. 10

3. *(a)* Give the schematic diagram for the following conveyors : 2+2+3+3=10

(i) Belt Conveyor

(ii) Segmented Belt Conveyor

(iii) Roll and Skate Wheel Conveyors

(iv) Screw Conveyors.

(b) A belt conveyor with an inclination of 15° to the horizontal is to be used for the transportation of chocolate granules from storage room to processing plant. The bulk density of the granules $3500 kg/m^3$. Production at the plant is $3000 tonne/h$. For a belt speed of $1{\cdot}6 m/s$, calculate the width of the belt to be used for the above operation.

Data : $K_a = 0{\cdot}067$ 5

$C_i = 0{\cdot}95$

(c) 25 *tonnes/h* of wheat powder is to be transported to the packaging section by a horizontal screw conveyor. With the following data, find out a suitable screw arrangement for the service.

Data :

Bulk density of material = 1400 kg/m^3

Filling co-efficient = 0·135

Lead of the screw (screw pitch)/ Diameter of the screw = 0·9

Speed of the screw shaft = 45 *rpm*.

5

4. (a) Discuss about the following sorting equipment : 5×2=10

(i) Belt / Cable sorter

(ii) Roller sorter

(iii) Spiral sorter

(iv) Cylindrical separator

(v) Disc separator.

(b) Discuss about the different screening systems used in the mechanical separation of solid particles.

10

5. *(a)* Classify shell and tube heat exchanger and explain it. (based on mechanical configuration). 5×3=15

(b) Provide the schematic diagram of shell and tube heat exchanger. 5

6. *(a)* Explain about the following parts of shell and tube heat exchanger : 10+7+3=20

(i) Tube sheet

(ii) Shell side and Tube side passes

(iii) Baffles and Tie Rods.

7. *(a)* Discuss about the design conditions and stresses for pressure vessels. 10

(b) Write short notes on the designing of "shell" in the pressure vessel manufacturing process. 10