D 4061

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Fourth Semester

Biotechnology

BT 1252 — UNIT OPERATIONS

(Regulation 2004)

Time : Three hours
Maximum : 100 marks

Any missing data may be assumed.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Flow number.

2. What is Vortex and how is it prevented?

3. What are free and hindered settling?

4. What are the various resistances in filtration and how do we reduce them?

5. What are fins and when do we use them?

6. Explain Thermal diffusivity and Fourier number.

7. Define Prandtl number and Nusselt number.

8. Sketch the temperature profile for liquids in a 1-2 Shell and tube heat exchanger.

9. Explain NTU.

10. 300 kgs/hr of a solution with 10% solids is concentrated to 30% solids. Estimate the capacity and economy of evaporation if 100 kgs/hr of fresh steam is used for evaporation.

11. (a) Explain with neat sketches, different types of impellers used for agitating liquids. (16)

Or

(b) (i) Using Dimensional analyses, obtain expressions for Power number in terms of Reynolds number and Froude number. (10)

(ii) Distinguish Blending and Mixing. (6)

12. (a) (i) Explain the basic characteristics of filter Media and filter aids. (6)

(ii) Distinguish constant pressure filtration and constant volume filtration. (4)

(iii) Explain briefly the principle and working of a centrifugal filter. (6)

Or

(b) Explain the construction and working of a Rotary drum filter with a neat sketch. Discuss its applications. (16)

13. (a) State and explain Fourier's law of Heat conduction. Obtain an expression to predict the heat transfer through a cylindrical composite wall. (16)

Or

(b) (i) A flat furnace wall is made of 3 layer. The first inner layer is made of a refractory brick of thickness 120 mm and thermal conductivity 0.14 W/m K, backed by a common brick of thickness 230 mm and thermal conductivity 1.4 W/m K. The inner temperature of the furnace wall is 750 C and outer wall temperature is 75 C. (1) What is the rate of heat flow through the wall. (2) What is the temperature of the interface between refractory brick and common brick? (12)

(ii) Explain with neat sketches the different types of fins. (4)

14. (a) Explain Free and forced convection. Obtain an expression for Nusselt number as a function of Grashoff number and Prandlt number for Natural convection. (16)

Or

(b) (i) Distinguish film type and drop wise condensation. (6)

(ii) Explain the effect of noncondensable gases on rate of condensation. (4)

(iii) Explain LMTD and LMTD correction factors. (6)

15. (a) Discuss the different types of feeding multiple effect evaporators. Bring out their salient features. (16)

Or

(b) (i) Explain briefly the different methods available for the design of heat exchangers. (6)

(ii) For a single evaporator obtain expressions for Material and Energy balances. (6)

(iii) Name the various types of heat exchangers indicating the field of application. (4)