



Register Number:.....

B.TECH DEGREE EXAMINATIONS: NOV / DEC 2014

(Regulation 2009)

Fourth Semester

BIOTECHNOLOGY

BTY110: Unit Operations

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Mixing of plastic like masses can be handled effectively in a
 - a) Kneader mixer
 - b) Pony mixer
 - c) Beater mixer
 - d) Muller mixer
2. The suitable mixer for effective blending of light pastes in food industries is
 - a) Charge can mixer
 - b) Dispenser
 - c) Masticator
 - d) Kneader
3. The rate of washing for a washing type of plate and frame filter press is equal to
 - a) 1/4 of final rate of filtration
 - b) Final rate of filtration
 - c) 1/2 of final rate of filtration
 - d) Twice the final rate of filtration
4. The most common type of rotary drum filter rotates at
 - a) 0.1-2 rpm
 - b) 0.5-3 rpm
 - c) 1-3 rpm
 - d) 1-5 rpm
5. Which one of the following has highest thermal conductivity?
 - a) Monel
 - b) Copper
 - c) Nickel
 - d) Copper with traces of arsenic
6. Two thin blankets are warmer than a single blanket of double thickness because
 - a) The conductivity of the single blanket is more
 - b) The conductivity of two blankets is less
 - c) The conductivities of blankets are equal
 - d) None of the above

7. Overall heat transfer coefficient for a water heater using kitchen gas is controlled by the
 - a) Film coefficient of water
 - b) Film coefficient of gas
 - c) Dirt factor for water film
 - d) Dirt factor for gas film
8. Dropwise condensation is favoured on a surface which is generally
 - a) Smooth
 - b) Oily
 - c) Glazed
 - d) Coated
9. The capacity for a multiple effect evaporator depends on the
 - a) Number of effects
 - b) Overall temperature difference
 - c) Mode of feeding
 - d) Steam economy
10. Fruit juices can be concentrated in a
 - a) Long tube evaporator
 - b) Falling film evaporator
 - c) Short tube vertical evaporator
 - d) Agitated film evaporator

PART B (10 x 2 = 20 Marks)

11. Differentiate agitation and mixing.
12. How will you calculate the power required to agitate liquids if power number is known?
13. Write short notes on filter aids.
14. Define filtration with an example.
15. State Fourier's law of heat conduction.
16. Write short notes on overall heat transfer coefficient.
17. Differentiate condenser and reboiler.
18. Sketch a temperature profile for counterflow heat exchanger.
19. Define evaporation with an example.
20. State Duhring's rule.

PART C (5 x 14 = 70 Marks)

21. a) Derive an expression for power number in agitated vessels by dimensional analysis.

(OR)

- b) Write detailed account on the following agitators:
 - (i) Paddle (4)
 - (ii) Turbine (4)
 - (iii) Propeller (3)
 - (iv) Helical ribbon (3)

22. a) Describe the principle, construction and working of vacuum leaf filter with a neat sketch. Also, write its merits, demerits and applications.

(OR)

- b) Derive an expression for pressure drop through filter for constant pressure filtration.

23. a) Derive an expression for Nusselt number in natural convection by dimensional analysis.

(OR)

- b) Explain the mechanism of the following:

(i) Boiling (9)

(ii) Condensation (5)

24. a) Describe the principle, construction and working of double pipe heat exchanger with a neat sketch. Also, write its merits, demerits and applications.

(OR)

- b) Water is flowing at the rate of 10 tph through the tubes of water-water heat exchanger and is heated from 25 to 70°C. Hot water at 90°C is available, but the minimum discharge temperature of this water has to be 76°C. The overall heat transfer coefficient based on the inside diameter of 25 mm tubes in a shell and tube heat exchanger is 900 kcal/m².h.K. If the hot water makes one shell pass and the design water velocity in the tubes is 0.45 m/s, calculate the number of tubes and length of the heat exchanger.

25. a) Describe the principle, construction and working of long tube vertical evaporator with a neat sketch. Also, write its merits, demerits and applications.

(OR)

- b) A single effect evaporator is to be designed to concentrate 10 tph of a solution from 10 to 20% (w/w) solids. Feed enters at 30°C. Saturated steam at 110°C (Latent heat of 540 kcal/kg) is available. Condensate leaves at saturation temperature. The solution boils at 45°C (Latent heat = 570 kcal/kg). Specific heats of all solutions may be taken as 1. Overall heat transfer coefficient may be taken as 1800 kcal/m².h.°C. Calculate steam consumption in kg/h and heat transfer area in m².
