

# UKA TARSADIA UNIVERSITY

B.Pharm. (1st Semester)

Subject :030020103 - Pharmaceutical Engineering

Duration: 3 Hours

Max. Marks: 70.

## Instructions:

1. Attempt all questions.
2. Write each section in a separate answer book.
3. Make suitable assumptions wherever necessary.
4. Figures to the right indicate full marks allocated to that question.
5. Draw diagrams/figures whenever necessary.

## Section-1

### Q-1 (A) Do as directed.

[07]

- I) Comment on type of flow of a fluid having Reynolds's number 124.
- II) Explain the term: dimensionless equation.
- III) State Fourier's law.
- IV) Define : Stoichiometry
- V) Differentiate unit operation and unit process.
- VI) Enlist two variable pressure head flow meters.
- VII) State Raoult's law.

### Q-1 (B) Answer the following in brief. (Any 4)

[08]

- I) Write a note on modes of heat transfer.
- II) Convert  $70 \text{ lb/in}^2$  to  $\text{Kg/cm}^2$ .
- III) Define : Volatility and relative volatility
- IV) Define tie substance. What is significance of tie substance in pharmacy?
- V) State law of conservation of mass and explain it with appropriate example.
- VI) Describe the terms: Dry saturated steam and superheated steam

### Q-2 Answer the following.

[10]

- A) Discuss the principle and applications of Azeotropic distillation and Steam distillation.

OR

- A) Write principle, construction, working, advantages and disadvantages of rotameter.
- B) Paper is passing through a tunnel dryer. The entering paper contains 10% water (dry basis, i.e. 10 Lb of water per 100 Lb of dry paper) and leaving paper contains 3% water on dry basis. How many pounds of water is evaporated per hour if 1000 Lb/hour of paper enters into the dryer.

OR

- B) Temperature of the inside of oven is  $450^\circ\text{F}$ . The inside wall of oven is of brick, which is 8 inch thick and having thermal conductivity  $2.2 \text{ Btu}/(\text{hr})(\text{ft}^2)(^\circ\text{F}/\text{ft})$ . Outside of oven is covered with a 3 Inch asbestos layer. Thermal conductivity of asbestos is  $0.12 \text{ Btu}/(\text{hr})(\text{ft}^2)(^\circ\text{F}/\text{ft})$ . Outside insulation has temperature of  $100^\circ\text{F}$ . Calculate heat loss through  $3 \text{ ft}^2$  of wall area in 3 hours.

### Q-3 Answer the following in detail. (Any 2)

[10]

- A) Derive Bernoulli's energy equation for steady flow of fluid in a pipe.
- B) Explain McCabe Thiele method for calculation of number of theoretical plates in distillation.
- C) What is black body? Write a note on Stefan- Boltzman's law.

**Section-2**

**Q-4 (A) Do as directed.**

**[07]**

- I) State Duhring's rule.
- II) Enlist four factors which affect selection of dryers in industry.
- III) Define: Sublimation
- IV) Comment: Type of solids in slurry affects selection of filter medium in filtration process.
- V) Enlist two applications of Freeze drying process.
- VI) Specify the pore size of membrane filter used for sterilisation process.
- VII) Define : Filter cake

**Q-4 (B) Answer the following in brief. (Any 4)**

**[08]**

- I) Differentiate between evaporation and distillation.
- II) Define filter aid. Enlist ideal properties of filter aids.
- III) Write construction of plate and frame filter press with suitable diagram.
- IV) Calculate centrifugal effect for a centrifuge with a diameter of 1 meter which rotates at frequency of  $16 \text{ sec}^{-1}$ .
- V) Discuss principle of fluid/fluid mass transfer process.
- VI) Enlist four dryers used for drying of granules in industry.

**Q-5 Answer the following.**

**[10]**

- A) Discuss the factors affecting rate of drying.

OR

- A) Write a note on construction, working, merits and demerits of vacuum dryer.  
B) Write principle, construction, working, merits and demerits of climbing film evaporator.

OR

- B) Write principle, construction, working and modifications of rotary drum filter.

**Q-6 Answer the following in detail. (Any 2)**

**[10]**

- A) Discuss the phenomenon of solid/ fluid mass transfer process.
- B) Write principle, construction, working and applications of conical disc centrifuge.
- C) Discuss about factors affecting rate of filtration.