

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: steam as effective mean of heat transfer.
- II) Differentiate between fluid statics & fluid dynamics.
- III) Why Reynolds number is unit less?
- IV) Define Vena contract
- V) Convert 12.7 PSI to Lb / ft²
- VI) What is LMTD?
- VII) What is dryness fraction?

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

[08]

- I) Comment – simple distillation is suitable for separation of clove oil from water
- II) Differentiate between orifice & Venturi meter.
- III) Differentiate between mechanical & thermostatic steam trap with suitable examples.
- IV) Write a short note on Reynolds Number.
- V) Describe boiling point diagram.
- VI) Write the application of destructive distillation.

Q-2 Answer the following.

[10]

- A) A mixture containing 30% HNO₃, 40% H₂SO₄ and 30% H₂O by weight is made by mixing concentrated H₂SO₄ (98% by weight H₂SO₄), HNO₃ (90% by weight) & waste acid (20% H₂SO₄, 75% H₂O and 5% HNO₃). Calculate poured of H₂SO₄, HNO₃ & waste acid for 1000 lb final mixture.

OR

- A) A dehumidifier sprays 40 Lb of cold water per min in to a stream of air 100 Lb of wet air per min. Enters the dehumidifying chamber. The absolute humidity of the entering air is 0.05Lb water vapour / Lb dry air and that of leaving air is 0.01 Lb water vapour / lb dry air. Calculate (a) what is total weight of liquid leaving the dehumidifier per min? (b) what is the weight of wet air leaving per min.

- B) A glass window with an area 6 ft² is installed in a wooden wall of a room. The dimensions of this wall are 10 by 10 ft. the wood is 1 inch thick & has a thermal conductivity of 0.087 Btu / (hr) (ft²) (°F/ft). The glass is 1/8 inch thick & has a thermal

conductivity of $0.40 \text{ Btu} / (\text{hr}) (\text{ft}^2) (^\circ\text{F}/\text{ft})$. If inside wall & glass temperature is 90°F & outside wall and glass temperature is 30°F . Calculate the total amount of heat conducted through the wall & glass per hour.

OR

A mercury manometer is conducted across a venture meter. The pressure on upstream B) side (P_1) is $0.5 \text{ kg} / \text{cm}^2$ gauge. The manometer reading (ΔP) is 70 mmHg . The fluid flowing is water. Calculate the pressure at throat (P_2).

Q-3 Answer the following in detail. (Any 2) [10]

- A) Draw neat & labeled diagram, working calculation steps, advantages, disadvantages & application of Venturi meter.
- B) Discuss concept of resistance to flow of heat in series.
- C) Explain methods for calculating theoretical number plates in rectification column.

Section-2

Q-4 (A) Do as directed. [07]

- I) Define filter aid
- II) Enumerate factors affecting rate of evaporation.
- III) What is an azeotropic mixture?
- IV) Write limitation of Raoult law.
- V) Define CMC of solid.
- VI) What is constant rate period in drying?
- VII) Enlist all non thermal methods of drying.

Q-4 (B) Answer the following in brief. (Any 4) [08]

- I) Write a note on freeze drying.
- II) Write down ideal properties & different types of condenser.
- III) Give the example and discuss different technique for using filter aid
- IV) Write the theory of centrifugation & Significance
- V) Differentiate between Drying & Evaporation
- VI) Describe the rate of drying curve

Q-5 Answer the following. [10]

Granules of Paracetamol containing 80 Lb of water / 100 Lb of dry granules are being dried in a conveyor dryer. They dry at a constant rate of $5 \text{ Lb water} / \text{Lb. gr. hr}$, down A) to a 50% moisture content ($0.3 \text{ Lb water evaporated} / \text{Lb -gr.}$) and then at a rate of proportional to moisture content. Calculate the time required to reach a water content of 1% ($0.01 \text{ Lb H}_2\text{O} / \text{Lb -gr. dry}$). Consider equilibrium moisture content is zero.

OR

- A) Discuss principle, construction, working, advantages and disadvantages of batch centrifugation
- B) Discuss principle, construction, working, advantages and disadvantages of Plate and Frame filter press.

OR

A rotary filter turns at the rate of 2.0 rpm. The fraction of total filtering area immersed in the slurry is 0.20. It has been observed that 1.5 cu ft of filtrate is delivered per minute per square foot of submerged area with given slurry under these operating conditions. If 6 ft³ of the filtrate is delivered per revolution by rotary filter, what is the total area of the filter cloth on the drum?

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

[10]

- A) Draw neat & labeled diagram, construction, working, advantages, disadvantages & application of Rotary drum filter.
- B) Discuss mechanism of climbing, construction, working, advantages and disadvantages of climbing film evaporator.
- C) Draw neat & labeled diagram, construction, working, advantages, disadvantages & application of Fluidised Bed dryer.