	Utech
<i>Name</i> :	
Roll No.:	The second of the second
Invigilator's Signature :	

## PHARMACEUTICAL ENGINEERING

Time Allotted: 3 Hours Full Marks: 70

The figures in the margin indicate full marks.

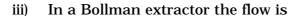
Candidates are required to give their answers in their own words as far as practicable.

#### **GROUP - A**

## (Multiple Choice Type Questions)

- 1. Choose the correct alternatives for any *ten* of the following :  $10 \times 1 = 10$ 
  - i) Drying involves
    - a) mass transfer
- b) heat transfer
- c) both (a) & (b)
- d) none of these.
- ii) Psychrometry deals with the properties of
  - a) Air water-vapour mixture
  - b) Gas vapour mixture
  - c) both (a) and (b)
  - d) none of these.

5345 (N) [ Turn over





- a) Co-current
- b) Counter-current
- c) both (a) and (b)
- d) none of these.

## iv) Penicillin is recovered from the fermentation broth by

- a) Distillation
- b) Evaporation
- c) Leaching
- d) Liquid extraction.
- v) Plate towers, packed towers and spray towers are related to
  - a) distillation
  - b) extraction
  - c) dehumidification
  - d) none of these.
- vi) For molar distillation the important parameter is
  - a) boiling point
- b) mean free path
- c) none of these
- d) all of these.

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- vii) The principal objectives(s) of steam distillation is/are
  - a) separation of volatile oil
  - b) preparation fo aromatic water
  - c) separation miscible liquid mixture with low boiling points
  - d) both (a) & (b).
- viii) 'Interface mass transfer' is defined as
  - a) mass transfer from bulk of one phase to interface surface and from interface to bulk of another phase
  - b) mass transfer from bulk of one phase to interface surface
  - mass transfer from bulk of one phase to bulk of another phase
  - d) all of these.
- ix) Which of the following is not a packing materials for rectification column?
  - a) Lessing ring
  - b) Berl saddle
  - c) Raschig ring
  - d) None of these.

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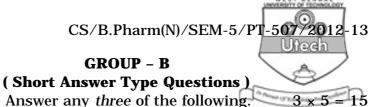
- x) In general flash distillation is not used for
  - a) binary system
  - b) muti-component system
  - c) only one phase/system
  - d) tertiary system.

xi) 
$$\int_{L_1}^{L_2} \frac{dl}{L} = \ln \frac{L_1}{L_2} \text{ stands for}$$

- a) Rayleigh equation
- b) Stefan's equation
- c) Boltzmann equation
- d) none of these.
- xii) At dew point temperature, humidity is
  - a) 0%
  - b) 50%
  - c) 100%
  - d) 80%.

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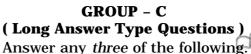
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- Discuss steady state diffusion with the help of Fick's First Law.
- 3. Explain the minimum boiling azeotropic mixture with proper boiling point diagram and exmaple.
- 4. What are cooling towers ? Explain their design and operation.
- What method of distillation would you employ for removal of free fatty acid from fixed oils. Give reasons for using such a distillation.
- 6. For a mixture of air and water vapour of 70°C calculate:
  - a) humidity when air is saturated
  - b) humidity when relative humidity of air is 50%

Data given, vapour pressure of water at 70°C = 233.7 mm Hg.

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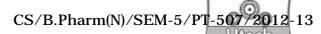
- 7. a) With a neat sketch explain the working of compartment tray dryer, its application in pharmaceutical industry, its merits and demerits.
  - b) State Raoult's law. What is its significance? 10 + 5
- 8. A binary mixture of benzene and toluene containing 40 mole per cent benzene is to be distilled at atmospheric pressure to recover 90% of the benzene. Estimate the molal per cent of the mixture which should be distilled and the composition of the distillate obtained if the distillation is carried out by
  - a) Simple equilibrium distillation
  - b) Differential distillation collecting all the distillate together.

Data given : The average relative volatility of benzene to toluence in the temperature range involved is 2.5.

9. What do you understand by azeotropic distillation? What is imbibition? Explain continuous extraction process.

3 + 2 + 10

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- 10. a) What do you understand by Humidity chart 2 Briefly discuss its significance in air conditioning. 3 + 4
  - b) Air in a laboratory at 110°F and atmospheric pressure contains 0.21 lb of water vapour per lb of dry air.
    Determine the humidity percentage.
- 11. Desribe the working principle of a dehumidifier. What is referigerant? What are the factors for selection of refrigerant? What are brine system of refrigeration?

5 + 3 + 4 + 3

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