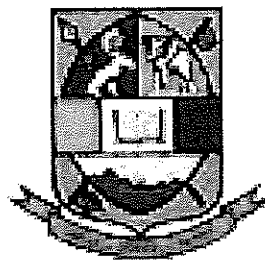


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1ST SEM. 2020/21

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UNIVERSITY OF ESWATINI

SPECIAL PAPER

**PROGRAMME : BACHELOR OF SCIENCE IN FOOD SCIENCE,
NUTRITION AND TECHNOLOGY YEAR II**

COURSE CODE : FNS201

TITLE OF PAPER : PRINCIPLES OF FOOD ENGINEERING

TIME ALLOWED : TWO (2) HOURS

INSTRUCTIONS : ANSWER ALL THE QUESTIONS

**DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY
THE CHIEF INVIGILATOR**

QUESTION 1

- (a) A dilute orange juice flowing through a pipe at a rate of 30 kg/min having 10% solid is mixed with concentrated juice that has 35 % solids at constant rate. The final mixed product has 20% solids. (14 Marks)
 - (i) At what rate would the concentrated juice be added
 - (ii) Calculate the rate (kg/min) at which product is collected

- (b) A moist air has a dry bulb temperature of 25°C and absolute humidity of 8 g/Kg dry air. Using the psychrometric chart determine the other properties of the air. (10 Marks)

- (c) A composite plane wall consists of two layers A and B with 15 m² area. The thermal conductivity of layers A and B are 0.03 W/m°C and 15 W/m°C and thickness 5 cm and 15 cm, respectively. If 100W/m² is transferred through the wall at steady state, calculate:
 - (i) The total resistance
 - (ii) the temperature difference across the layers. (16Marks)

[TOTAL MARKS = 40]

QUESTION 2

- (a) Explain the following:
 - i. batch process
 - ii. Shear thickening
 - iii. Lethality rate
 - iv. D-value
 - v. Equilibrium moisture content (5x4 = 20 Marks)

- (b) Describe the advantages of continuous operation over batch operation. (10 Marks)

[TOTAL MARKS = 30]

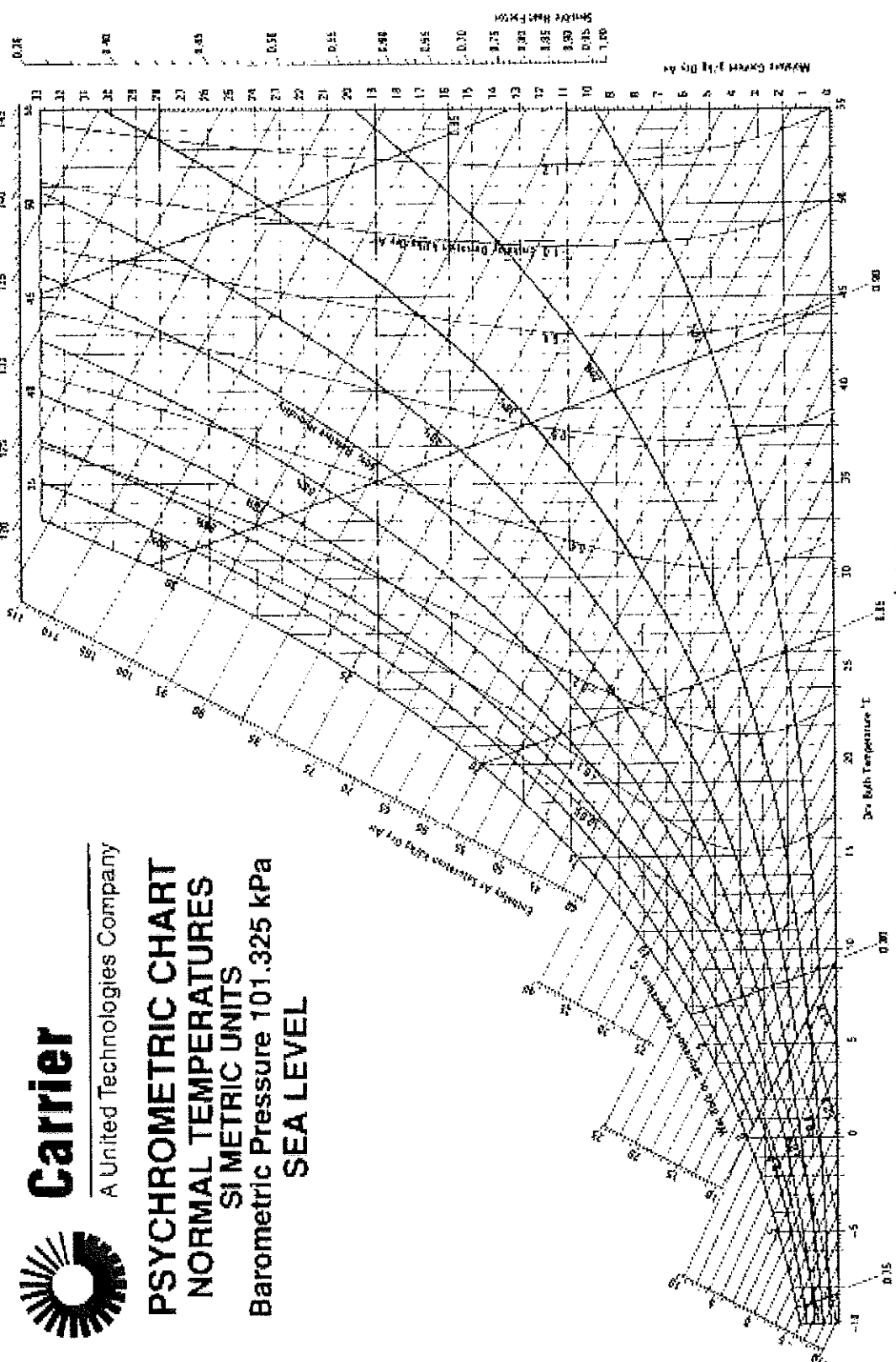
QUESTION 3

- (a) Describe steady state and unsteady state systems. (10 Marks)

- (b) Explain the changes in the physical properties of refrigerants in the compressor and evaporator. (10 Marks)

- (c) Define psychrometry and outline the properties determined from a psychrometric chart. (10 Marks)

[TOTAL MARKS = 30]



Carrier
A United Technologies Company

PSYCHROMETRIC CHART
NORMAL TEMPERATURES
SI METRIC UNITS
Barometric Pressure 101.325 kPa
SEA LEVEL

Revised 11/01 Psychrometric and Humidity Ratio Scales are in line