1ST SEM. 2017/18

UNIVERSITY OF SWAZILAND

SUPPLEMENTARY EXAMINATION 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 QUESTION ONE (1) AND ANY OTHER TWO (2) QUESTIONS.

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

QUESTION 1 (COMPULSORY)

(a) Air at 20°C and 10 g/kgda is heated to 45°C. Determine the thermodynamic properties of the air before and after heating. **(11 Marks)**

(b) A rectangular slab is made of brick lined with insulator. The temperature of the inner slab surface is 10°C and that of the outer surface is 35°C. The thickness of the brick layer is 20 cm and the thickness of the insulation is 5 cm. The thermal conductivity of brick and the insulator is 1.5 W/m°C and 0.06 W/m°C respectively, Calculate the total resistance of the slab to heat transfer and the heat transfer losses through the wall if the slab area is 16 m^2. **(15 Marks).**

(c) In a laboratory experiment it was found that heating a suspension of spores at 120°C for 100 seconds results in reduction of microbial load from 10^3 to 10^{-5} 8-log reduction of the spores. To achieve the same reduction at 110° C, 125 seconds are needed. Calculate the decimal reduction time at the two temperatures and the z value. **(14 Marks)**

[TOTAL MARKS = 40]

QUESTION 2

(a) With the help of a sketch, describe a three-effect multiple evaporation system with a parallel feed configuration. **(12 Marks)**

(b) List five points that need to be considered in selecting a refrigerant. **(10 Marks)**

(c) Describe the hysteresis mechanism. **(8 Marks)**

[TOTAL MARKS = 30]

QUESTION 3

(a) Explain the following:

i. Bingham plastic fluid
ii. Heating rate constant
iii. Batch system
iv. Turbulent flow
v. hysteresis

(5x4 = 20 Marks)

(b) List the factors that influence the rate of convective mass transfer **(10 Marks)**

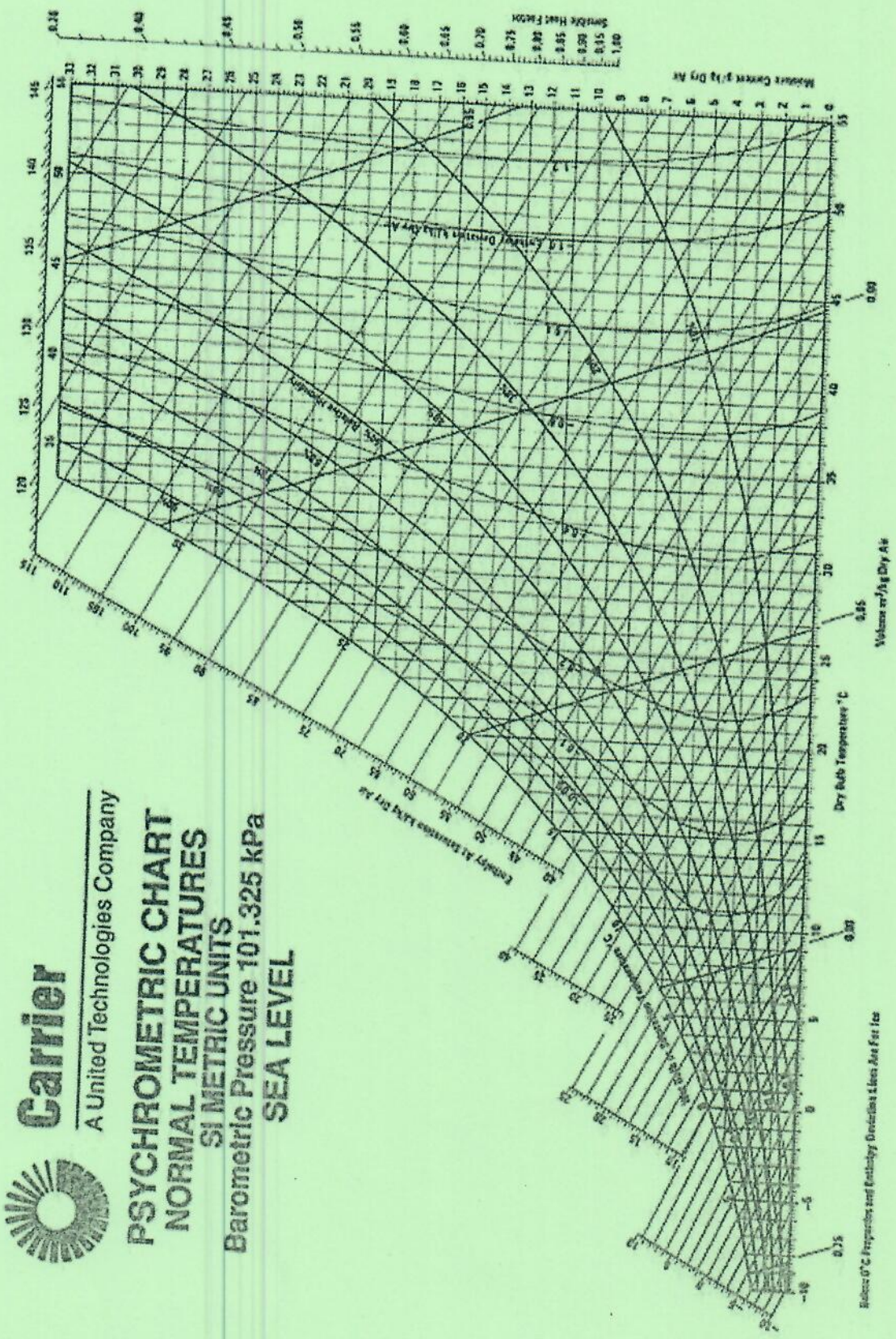
[TOTAL MARKS = 30]

QUESTION 4

(a) Describe the refrigeration cycle with the help of sketch including changes in the properties of the refrigerant as it flows through the different units. **(16 Marks)**

(b) With the help of a sketch, show a drying process on the pyschrometric chart and describe the changes in the property of the air before and after drying. **(14 Marks)**

[TOTAL MARKS = 30]


Carrier
A United Technologies Company
PSYCHROMETRIC CHART
NORMAL TEMPERATURES
SI METRIC UNITS
Barometric Pressure 101.325 kPa
SEA LEVEL
Dry Bulb Temperature °C
Volume m³/kg Dry Air
Enthalpy kJ/kg Dry Air
Moisture Content g/kg Dry Air
Sensible Heat Factor