1ST SEM. 2018/19

PAGE 1 OF 4

UNIVERSITY OF ESWATINI

RE-SIT 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.**

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QUESTION 1 (COMPULSORY)

(a) Air at 25°C and 10 g/kgda is heated to 40°C and then enters a continuous dryer in adiabatic operation. The air exits the dryer at 90% RH.
   i. Determine the thermodynamic properties of the air before and after heating.
   ii. Calculate the inlet volumetric flow rate of air required to remove 12 kg of water/h from the product.

(15 Marks)

(b) A rectangular slab is made of stone masonry lined with insulator. The temperature of the inner slab surface is 7°C and that of the outer surface is 31°C. The thickness of the stone masonry is 15 cm and the thickness of the insulation is 8 cm. The thermal conductivity of the stone and the insulator is 1.6 W/m°C and 0.07 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) Explain constant and falling drying rates.

(10 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) What are the factors that influence the rate of heat transfer in conduction? **(10 Marks)**

(c) Describe the behaviour of Bingham plastic fluid

(8 Marks)

**[TOTAL MARKS = 30]**

QUESTION 3

(a) Explain the following:
   i. Batch process
   ii. Laminar flow
   iii. Lethality rate
   iv. Survivors curve
   v. Z-value

(5x4 = 20 Marks)

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

[TOTAL MARKS = 30]

QUESTION 4

(a) Describe the steps in establishing process time using the formula method.   **(16 Marks)**

(b) Explain thermodynamic properties of refrigerants during refrigeration using Pressure– Enthalpy Charts.   (14 Marks)

[TOTAL MARKS = 30]
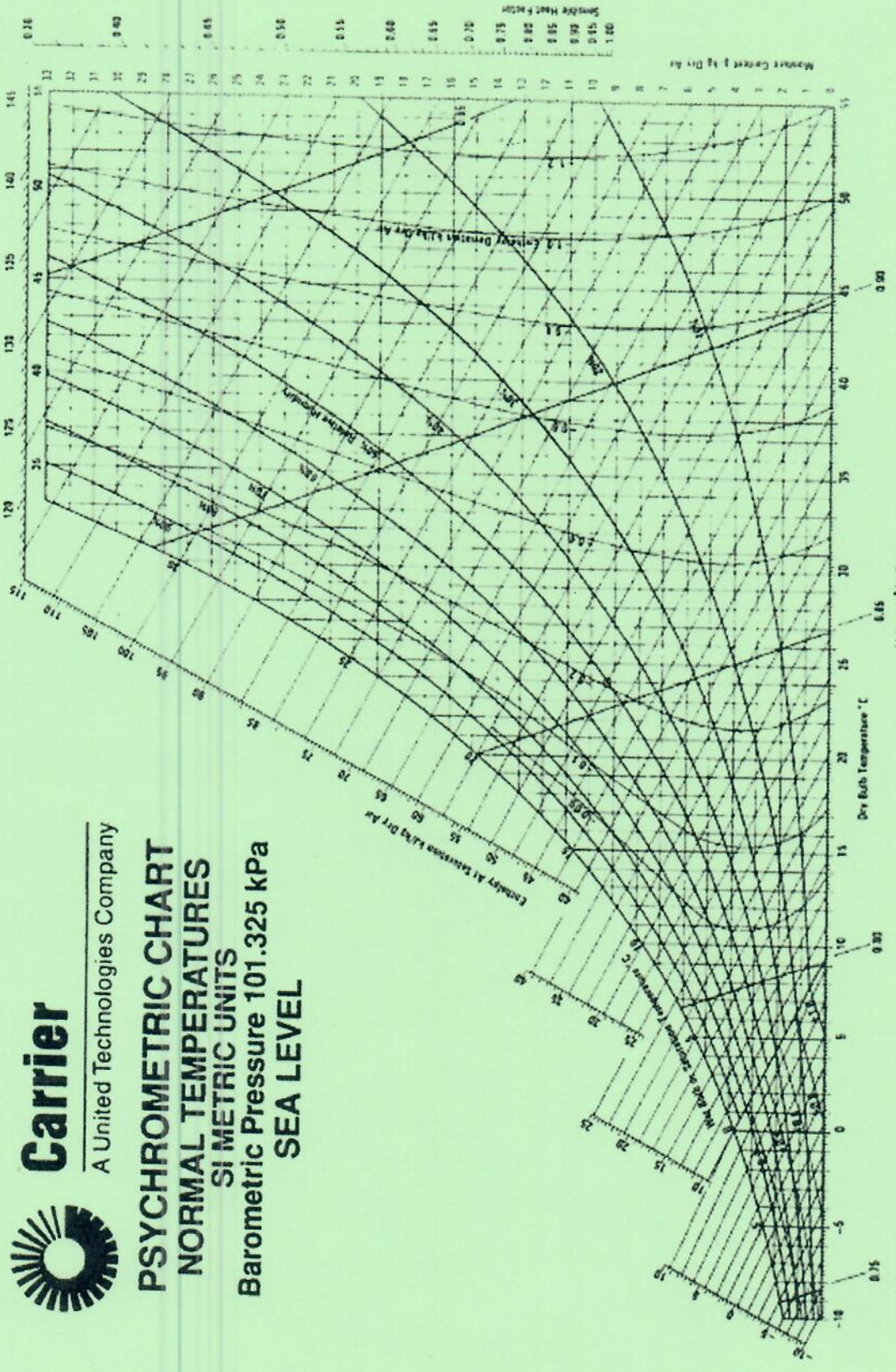
Carrier
A United Technologies Company

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