

1ST SEM. 2019/20

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**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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THE CHIEF INVIGILATOR**

QUESTION 1 (COMPULSORY)

- (a) Grape juice with 10% solid is flowing through a pipe at a rate of 40 kg/min. To adjust for the required solids, grape powder is added. At what rate would the powder be added to increase the solids content to 20%? **(10 Marks)**
- (b) Air at 30°C and 10 g/kgda is heated to 45°C and then enters a continuous dryer to dry mango slices. The air exits the dryer at 80% RH. Determine the thermodynamic properties of the air:
- (i) before and after heating and
 - (ii) after exiting the dryer.
- (c) A composite plane wall consists of two layers A and B with 10 m² area. The thermal conductivity of layers A and B are 0.02 W/m°C and 15 W/m°C and thickness 4 cm and 15 cm, respectively. If 100W/m² is transferred through the wall at steady state, calculate the temperature difference across the layers. **(17 Marks)**

[TOTAL MARKS = 40]

QUESTION 2

- (a) With the help of a sketch, describe a three-effect multiple evaporation system with a backward feed configuration. **(12 Marks)**
- (b) What are the factors that influence the rate of heat transfer in convection? **(10 Marks)**
- (c) Describe the behaviour of a Newtonian fluid. **(8 Marks)**

[TOTAL MARKS = 30]

QUESTION 3

- (a) Explain the following:
- i. Semi-batch process
 - ii. Shear thickening
 - iii. Lethality rate
 - iv. Dimensional consistency
 - v. Equilibrium moisture content
- (b) Describe the advantages of continuous operation over batch operation. **(10 Marks)**

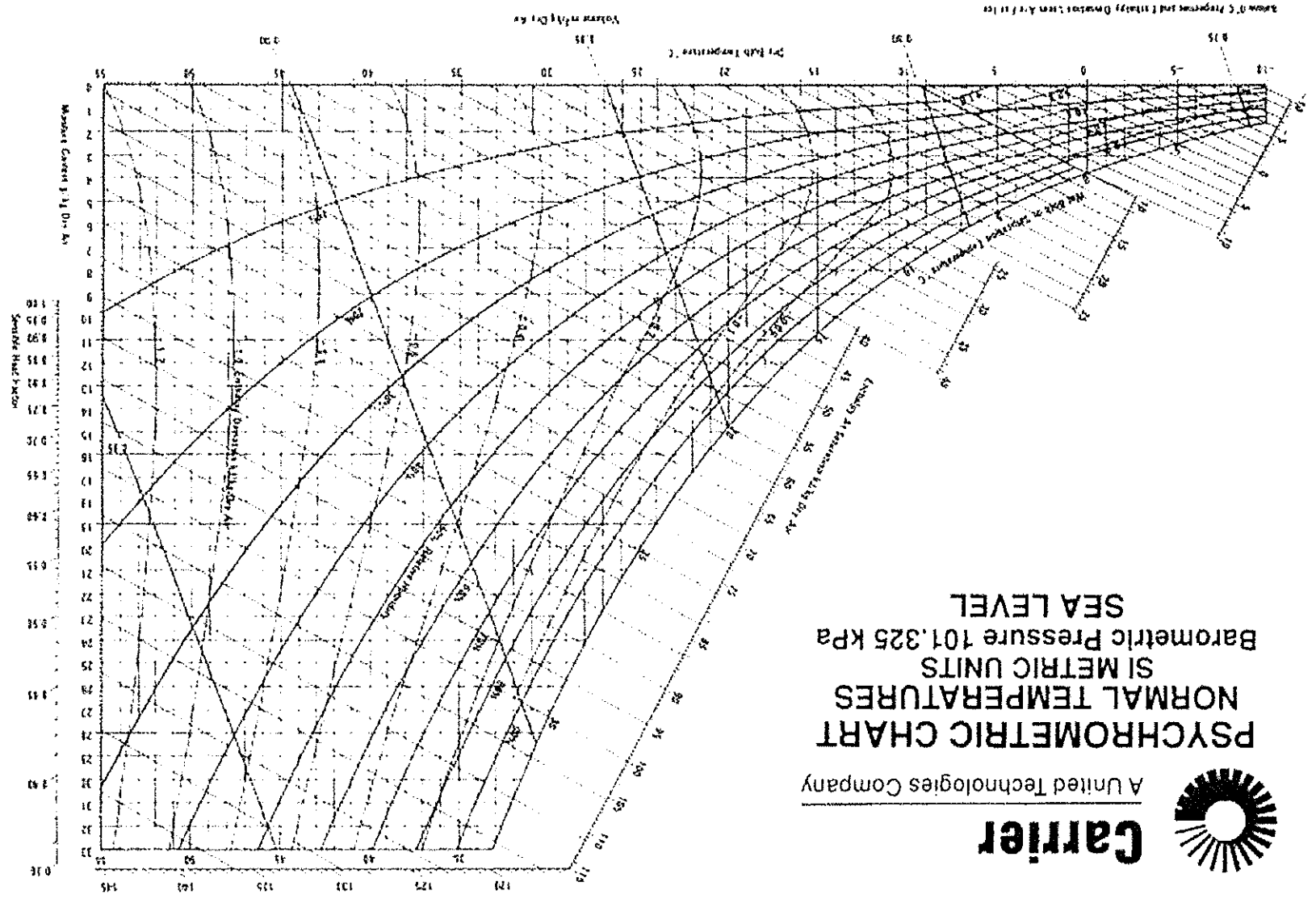
(5x4 = 20 Marks)

[TOTAL MARKS = 30]

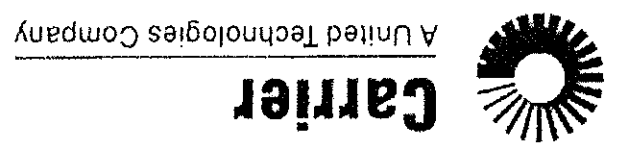
QUESTION 4

- (a) Describe laminar and turbulent flow. (10 Marks)
- (b) Explain the changes in the physical properties of refrigerants in the condenser and evaporator. (10 Marks)
- (c) Define psychrometry and describe the drying or adiabatic saturation process. (10 Marks)

[TOTAL MARKS = 30]



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



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