UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER

PROGRAMME: BSC LWM (4)

COURSE CODE: LUM 406

TITLE OF PAPER: CROP PROCESSING AND STORAGE

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: **CALCULATOR & PSYCHROMETRIC CHART**

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER QUESTIONS.

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SECTION ONE: COMPULSORY

QUESTION ONE

(a) With the aid of a diagram, describe the physical structure and biochemical composition of a cereal grain of your choice. (10 Marks)

(b) Briefly discuss the effect of drying on grain quality. (5 Marks)

(c) A bin full of maize grain is to be dried with air at a dry bulb temperature of 50°C. The air is delivered by a fan at a velocity of 0.55 m/s through a cylindrical duct of diameter 1.13m. The ambient air conditions are 30°C (Td.b.) and 22°C (Tw.b.) while the outgoing air is at 27.5 °C (Td.b.) and fully saturated, determine:

(i) The volumetric air flow rate (4 marks)
(ii) The amount of heat required per hour to heat the air. (8 marks)
(iii) The amount of water removed per hour from the grain. (8 marks)

(b) Describe how moisture is removed from a grain kernel during drying. (5 Marks)

SECTION II: ANSWER ANY TWO QUESTIONS

QUESTION TWO

(a) Give a description of the operations of:
   i. a hammer mill.
   ii. a burr grinder (10 Marks)

(b) Why is the hammer mill preferred more than other mills (10 Marks)

(c) In an attempt to classify a batch of milled grain, the following result was obtained in a sieve analysis.

Sieve Number	Weight of material retained above sieve (g)
2	0.0
4	22.8
8	26.8
14	94.0
28	33.6
48	141.2
100	26.0
Pan	55.6
Totals	**400**

Determine the (i) Percent retention for each sieve
(ii) Fineness modulus
(ii) Average grain size (10 Marks)

QUESTION THREE

(a) What is refrigeration? Briefly describe the operation of a vapour compression refrigeration system. (10 Marks)

(b) Discuss the weaknesses of traditional outdoor storage structures in general. Suggest ways of improving such structures. (20 Marks)

QUESTION FOUR

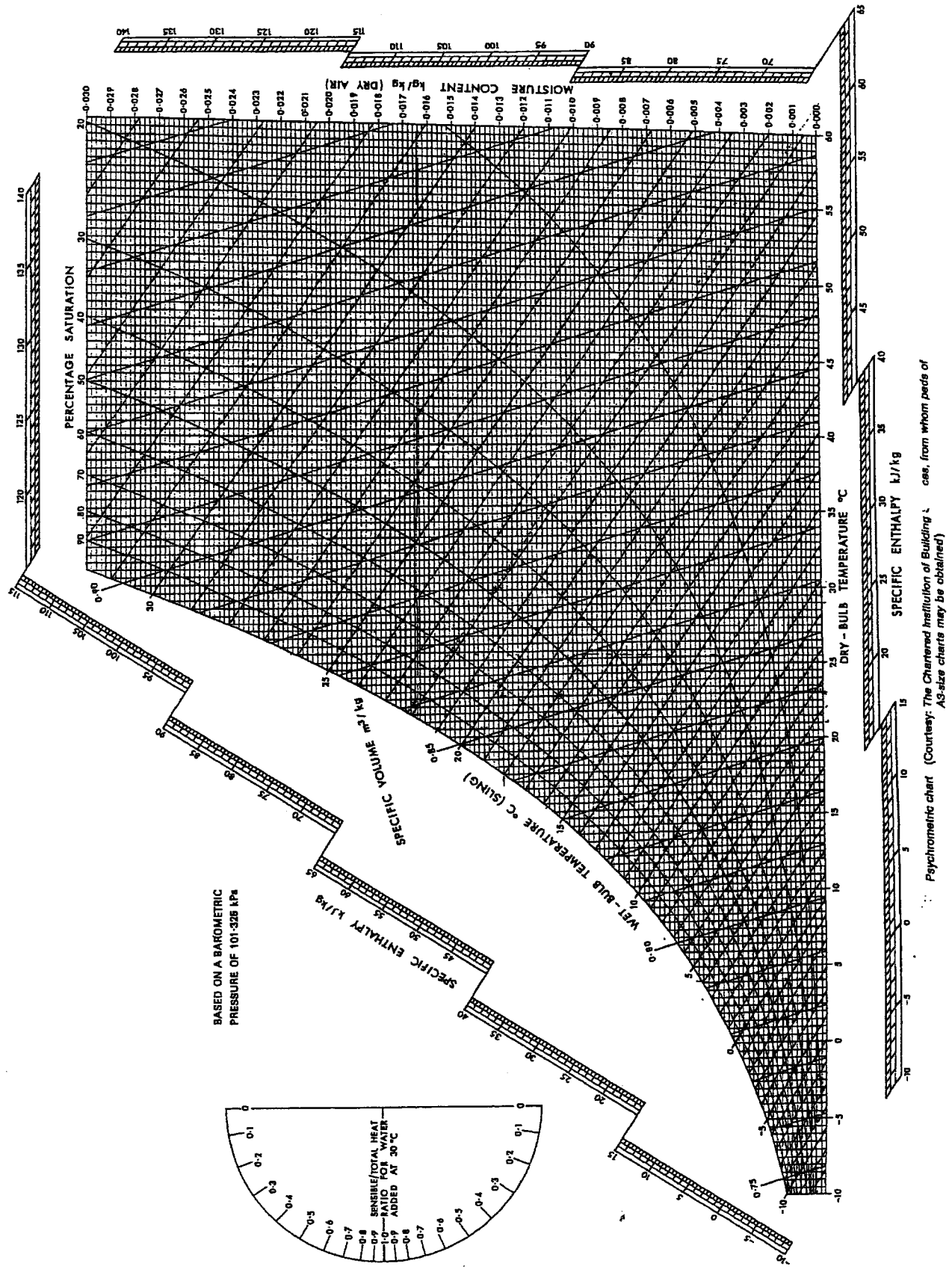
(a) What are the relevant factors that should be considered in the selection of a drying method? (5marks)

(b) Describe the process involved in solar drying of food using box dryers

(10 marks)

(c) With the aid of neat schematic representations, explain the principles of operation of the following artificial dryers;

i) Cross flow (*5 marks*)
ii) Counter flow *(5 marks*)
iii) Concurrent flow (*5 marks*)



Psychrometric chart (Courtesy: The Chartered Institution of Building Services, from whom pads of A3-size charts may be obtained)