2nd SEM.2011/2012

UNIVERSITY OF SWAZILAND
MAIN EXAMINATION PAPER

PROGRAMME: BSC AGRIC. ECON. & AG. BMgt (2)

COURSE CODE: ABE 208

TITLE OF PAPER: POST-HARVEST TECHNOLOGY

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: CALCULATOR &
                               PSYCHROMETRIC CHART

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO
OTHER QUESTIONS.

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2nd SEM.2010/2011

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SECTION ONE: COMPULSORY

QUESTION ONE

(a) A farmer uses a 20-litre container to determine bulk density of barley. The farmer's records are presented in the table below. You are assigned to help the farmer to fill in the table, interpret the data and determine storage space requirements for his grain.

Mass of empty 20-litre container	400g	
Mass of 20-litre container full of barley	11.2 kg	
Mass of 20 litres of barley		(2 ½ Marks)
Bulk density of barley		(2½ Marks)

(b) How much space does the farmer need to store 10 tonnes of barley? Give your answer in cubic meters (m^3). **(2½ marks)**

(c) The farmer intends to build cylindrical metal silos with capacity to store one **(1)** tonne of his barley each. He approaches you for advice on the design of the silos. You have an option to design a silo with a radius of 1.5 or 2 m due to material limitations.

(i) How much sheet metal would you require for each of the two design options? **(5 Marks)**

(ii) If the cost of sheet metal is E97.73 per square meter, how much would be the material cost of each of the two design options? **(5 Marks)**

(iii) Which of the two design options would you recommend to the farmer? Give your reasons for making that choice. **(2½ Marks)**

(d) Give a description of the steps involved in the salt method for estimating grain moisture content. **(10 Marks).**

(e) You have been invited to give a lecture on safety precautions when applying fumigants. List any five critical points that you would discuss. **(10 Marks)**

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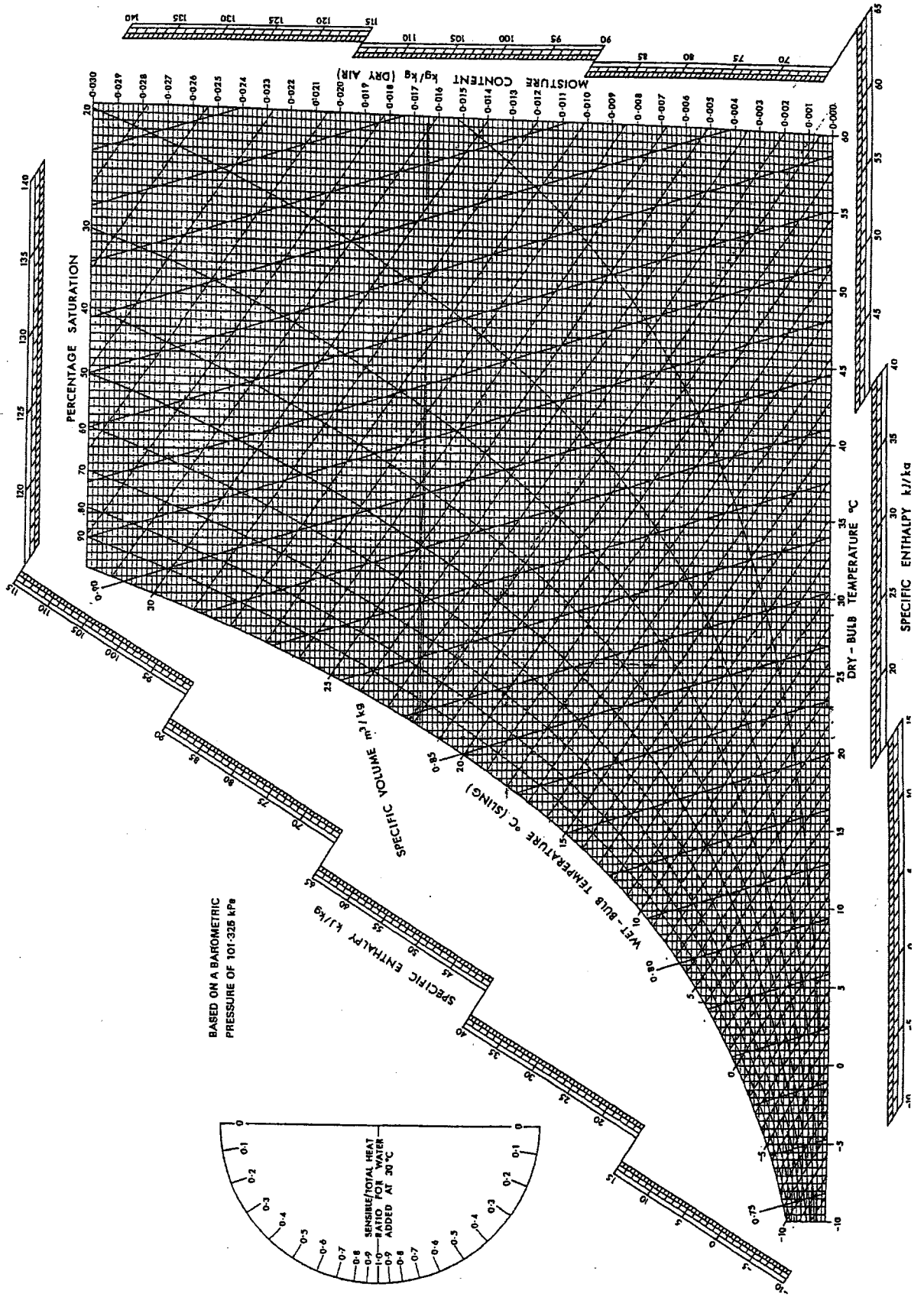
SECTION II: ANSWER ANY TWO QUESTIONS

QUESTION TWO

(a) Discuss the material and architectural design requirements for a grain storage house for the tropical regions. **(10 Marks)**
(b) Discuss the pros and cons of artificial grain drying. **(10 marks)**
(c) Discuss five damages caused by rats and mice (rodents) on the farm. **(10 Marks)**
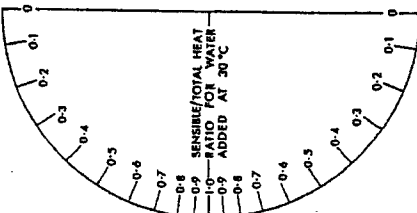
QUESTION THREE

(a)   Discuss five purposes of packaging a food product? **(10 Marks)**
(b)   In grain handling facility, a 2 –tonne batch of maize grain dropped in mass by 400 grams after going through a continuous flow dryer. Calculate;
(i) the dry basis moisture content of the grain **(5 Marks)**
(ii) the wet basis moisture content of the grain **(5 Marks)**
(c)   List and explain five post- harvest problems associated with the adoption of new technologies for crop production. **(10 Marks)**
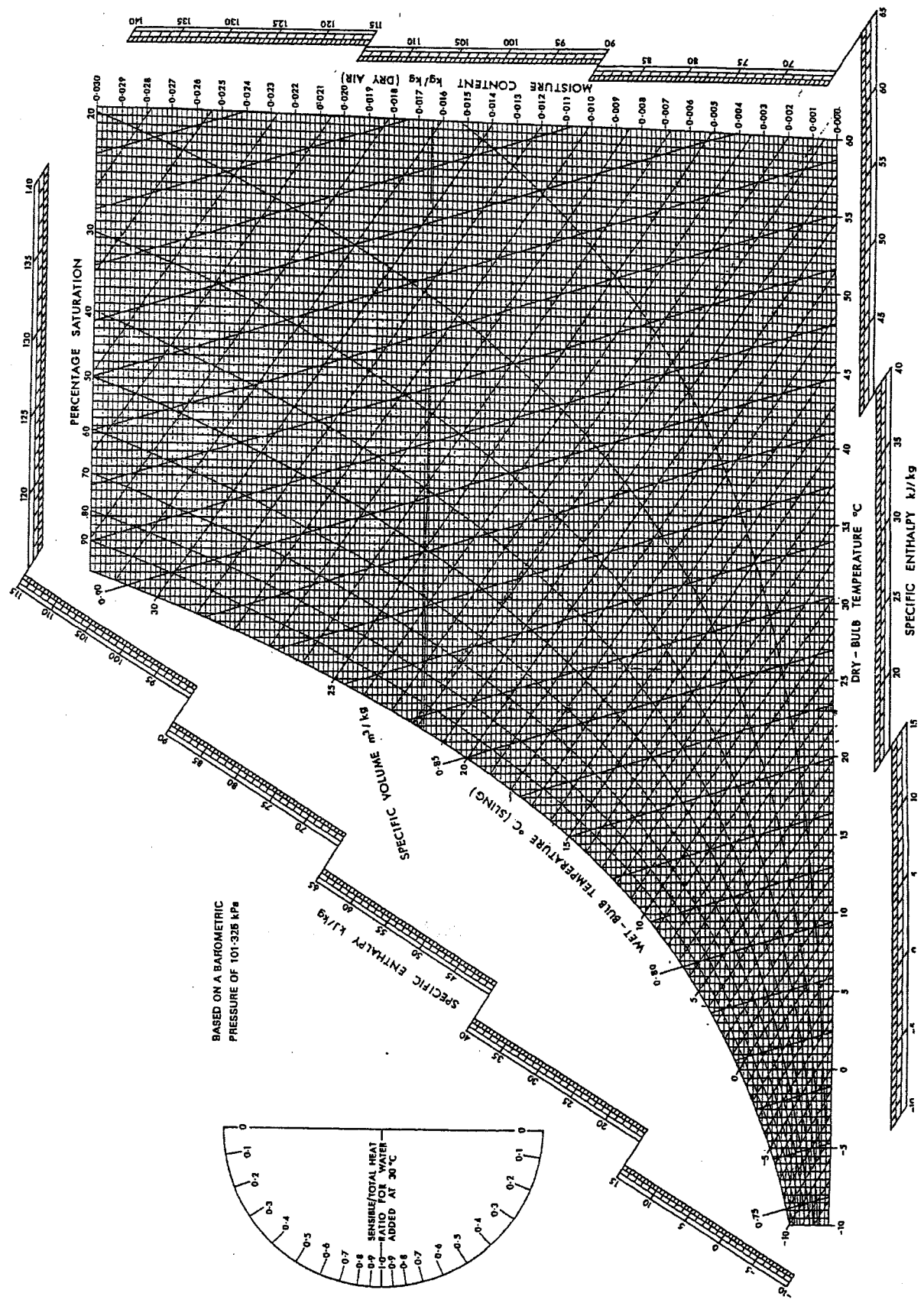
QUESTION FOUR

(a)   Briefly discuss the risks of field drying on grain quality.   **(10 marks)**
(b)   A bin full of maize grain is dried with air at a dry bulb temperature of $50°C$ and enthalpy of 87.5 kJ/kg. Ambient air is pumped through a heating unit to condition it for grain drying. The ambient air conditions are $30°C(T_{db}.)$ and $22°C(T_{wb}.)$. If the outgoing air is fully saturated; determine:

(i)   The psychrometric properties the ambient air, drying air and out going air. **(15 Marks)**
(ii)   The amount of heat required to heat a unit mass of ambient air.
(5 Marks)

PERCENTAGE SATURATION

MOISTURE CONTENT kg/kg (DRY AIR)

DRY - BULB TEMPERATURE °C

SPECIFIC ENTHALPY kJ/kg

WET - BULB TEMPERATURE °C (SLING)

SPECIFIC VOLUME m³/kg

SPECIFIC ENTHALPY kJ/kg

BASED ON A BAROMETRIC
PRESSURE OF 101·325 kPa

SENSIBLE/TOTAL HEAT
RATIO FOR WATER
ADDED AT 30 °C

PERCENTAGE SATURATION

MOISTURE CONTENT kg/kg (DRY AIR)

DRY - BULB TEMPERATURE °C

SPECIFIC ENTHALPY kJ/kg

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