



**UNIVERSITY OF SWAZILAND  
FINAL EXAMINATION PAPER**

**PROGRAMME: BSC AGRIC ECON. AGBMGT. II  
BSC AGRIC EDUC. II  
BSC AGRIC AGRON. II  
BSC ANI. SC. II  
BSC ANI. SC. (DAIRY). II  
BSC HORT. II**

**COURSE CODE: ABE 210**

**TITLE OF PAPER: PRINCIPLES FARM MECHANISATION**

**TIME ALLOWED: TWO (2) HOURS**

**SPECIAL MATERIAL REQUIRED: NONE**

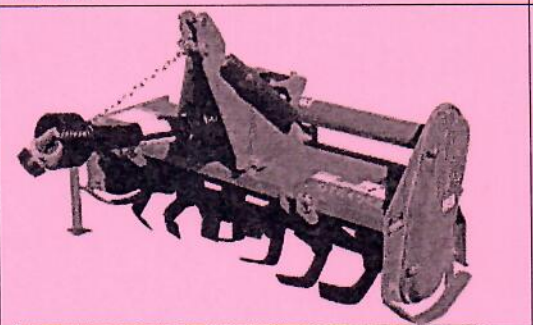
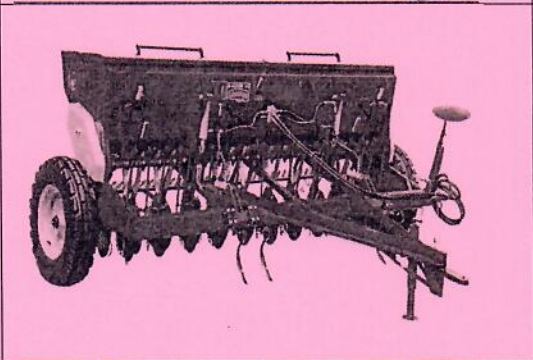
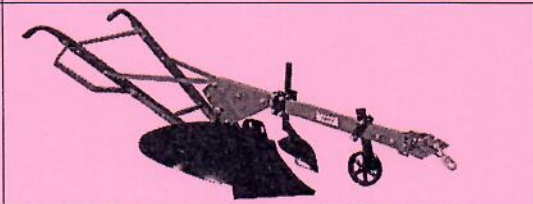
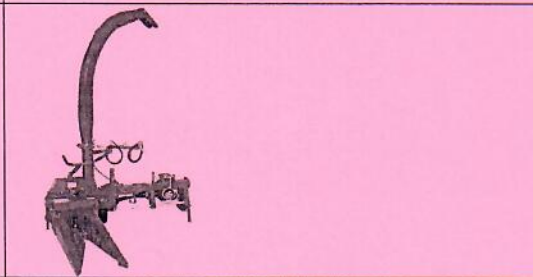
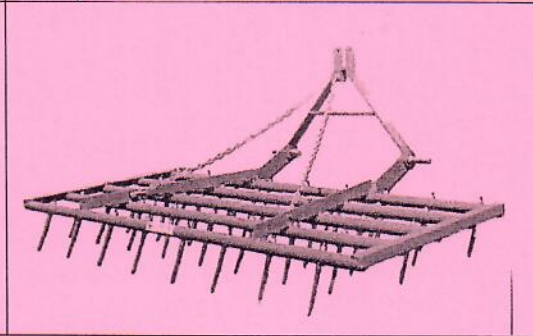
**INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO  
OTHER QUESTIONS.**

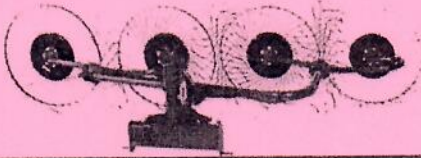
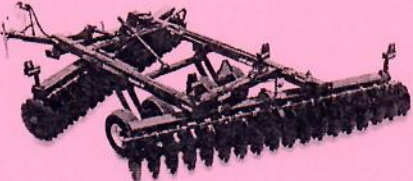
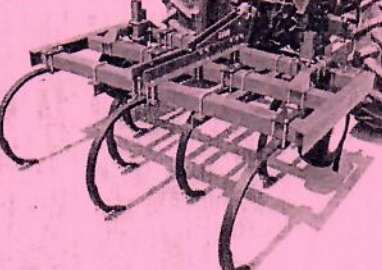


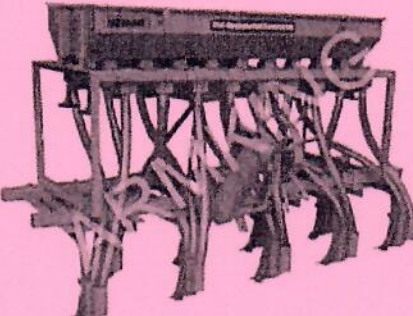
**DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN  
GRANTED BY THE CHIEF INVIGILATOR**

**QUESTION 1**

- a) What are the advantages and disadvantages of using farm machines for agricultural production in Swaziland? [6 marks]
- b) Distinguish between renewable and non-renewable energy sources that are used for farm operations. [4 marks]
- c) Explain why electrical energy is neither a renewable nor a non-renewable source of energy. [5 marks]
- d) Draught Animal Power, DAP is still used by farmers in Sub Saharan Africa.
  - i) What animal species are used in Swaziland for farm tasks? [2 marks]
  - ii) What are the benefits and limitations of using DAP in Swaziland? [9 marks]
- e) What are the different agricultural processes used in maize production? [5 marks]
- f) Table 1 shows farm equipment used for various farming processes. Fill in the Table the names of the equipment and farming processes they are involved in. the first one has been completed for you. (Submit Table 1 together with your answer script).

Table 1 Common equipment used for various farm processes.

	Picture	Name of equipment	Farming process
0	 A rotary tillage implement, possibly a rotovator, featuring a central shaft with multiple curved blades and a large rear wheel.	Rotary till / rotovator	tillage
1	 A front-end loader with a large front bucket, a steering wheel, and a rear wheel.		
2	 A hand plow with a single curved blade and a small rear wheel.		
3	 A harrow with a curved front blade and a small rear wheel.		
4	 A rake with a triangular frame and multiple long, thin tines.		

	Picture	Name of equipment	Farming process
5			
6			
7			
8			
9			
10			

**QUESTION 2**

- a) Discuss the advantages and disadvantages of the use of mould board ploughs as opposed to disc ploughs in Southern Africa [9 marks]
- b) Explain the purpose of leaving headland in a ploughing operation using a tractor? [4 marks]
- c)
- i) What are the different methods of ploughing land? [4 marks]
  - ii) Describe one with the help of a sketch. [6 marks]
- d) Figure 1 shows a span of two animals that are used to pull a plough in a soil whose draught resistance is 15 kN. If the draught force in the trek chain is 18 kN while inclined at an angle of the 20° to the horizontal,
- i) will the animals be able to pull the plough through the soil? [3 marks]
  - ii) what force is required in the trek chain to be just enough to pull the plough through the soil? [4 marks]

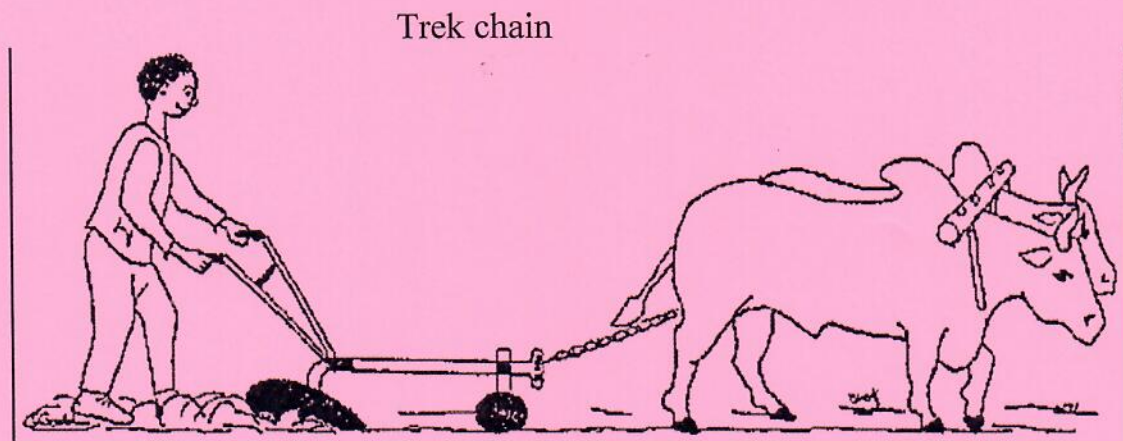


Figure 1 animal-plough-operator combination for tillage operations

## QUESTION 3

- a) Figure 2 show a picture of knapsack sprayer. Name the parts labelled in Table 2 and indicate their functions. [10 marks]

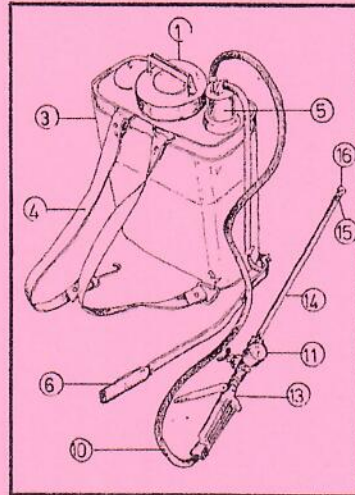


Figure 2. Parts of a knapsack sprayer.

Table 2. Names and functions of parts of a knapsack sprayer.

Part number	Part name	Function
3		
4		
5		
6		
16		

- b) Discuss the measures that can be taken to reduce spray drift when using conventional boom sprayers. [10 marks]
- c) A boom sprayer has a nozzle discharge of 0.02 L/s when recommended pump pressure of 250 kPa is developed in the chemical. The tractor is moving at speed 6 kmph while carrying a boom of 15 m whose nozzle spacing is 0.4 m. determine
- The application rate of the chemical in the field [6 marks]
  - The time to spray a 3 hectare field assuming a field efficiency of 80% [4 marks]

**QUESTION 4**

- a) Explain the concept of minimum tillage as compared to zero tillage in semi-arid regions. [10 marks]
- b) Given the planter layout shown in Figure 3, and assuming the use of a 16 cell seed plate, determine the average seed spacing achieved when:
  - (i) the 10 teeth sprocket is driving; [7 marks]
  - (ii) the 18 teeth sprocket is driving. [3 marks]
  - (iii) Also determine the plant population achieved in (i) and (ii) assuming a row spacing of 90 cm. [10 marks]

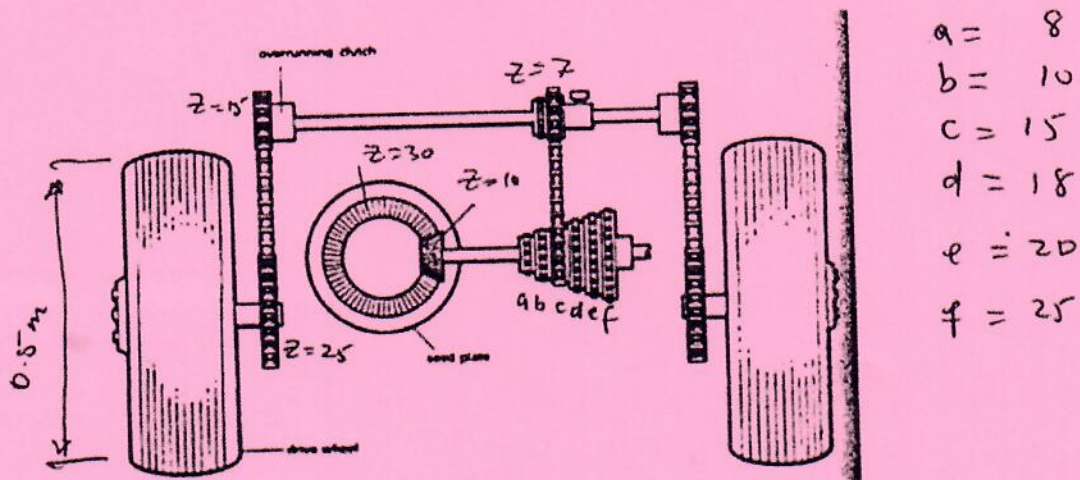


Figure 3 Drive mechanism for metering system of a planter