



**UNIVERSITY OF SWAZILAND  
RE-SIT EXAMINATION PAPER**

PROGRAMME: BSc AGRICULTURAL AND BIOSYSTEMS ENGINEERING 2

COURSE CODE: ABE202

TITLE OF PAPER: FARM MECHANISATION

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

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CHIEF INVIGILATOR

**SECTION 1: COMPULSORY QUESTION****QUESTION 1**

- a. With the aid of a diagram, explain the effect of soil moisture content on soil strength [5 marks]
- b. Discuss the implications of soil moisture content on tillage operations [10 marks]
- c. Distinguish between conventional and conservation tillage [5 marks]
- d. Classify planting equipment by method of placing seeds on the surface [5 marks]
- e. In order to meet the planting deadlines, a 30 hectare field should be ploughed in 6 field days, when working 12 hours per day.
- i. What is the expected field capacity [10 marks]
- ii. Determine the minimum width of cut if an operating speed of 5 km/hr and a field efficiency of 80% are expected. [10 marks]

**SECTION II: ANSWER ANY TWO (2) QUESTIONS****QUESTION 2**

- a. Explain the reasons for the widespread use of mouldboard ploughs in Swaziland. [10 marks]
- b. What important functions are performed by planters during planting? [10 marks]
- c. Explain briefly why disc ploughs are preferred to mouldboard ploughs in tropical countries [10 marks]

**QUESTION 3**

- a. A farmer has 60 kW two-wheel drive tractor with a mass of 6000 kg. The best operating speed is 7 km/hr when using a chisel plough in hard dry soils. The chisel plough applies a draught of 10.3 kN/m when operating at a depth of 250 mm. Assuming that only 2/3 of the engine power is available at the drawbar, calculate the maximum width of a plough that should be used. [15 marks]
- b. In a calibration exercise, 15 L of water was collected from 20 nozzles spaced 50 cm apart when a tractor was operating at a speed of 3 km/hr and had covered a distance of 150 m.
- i. What is the discharge from each nozzle in L/min? [7.5 marks]
- ii. What is the application rate? [7.5 marks]



**QUESTION 4**

- a. A three-bottom disc plough is used at Luyengo for ploughing at 300 mm where the soil resistance at that depth is 22 kN/m of cutting width. If each bottom has an effective cutting width of 45 cm, determine the draught power required from the tractor if ploughing is conducted at an average speed of 5 km/hr. **[10 marks]**
- b. Select a tractor to be used if the drawbar power (a above) is estimated to be 75% of the engine power. **[10 marks]**
- c. What time elements are responsible for the machine performance of farm machinery in agricultural operations? **[10 marks]**
- Discuss two of these (5 marks each)