

BINDURA UNIVERSITY OF SCIENCE EDUCATION
FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE

DAE 007

Department of Agricultural Economics Education and Extension
Bachelor of Science Honours Degree in Agricultural Engineering
Agricultural Mechanization

3 hours (100 Marks)

Instructions:

Answer **ANY FOUR** Questions. Each Question Carries 25 Marks.

JUN 2021

Question 1

- a) Explain the need for the use of dual wheels on tractors. [5 marks]
- b) With reference to tractor ballasting explain:
 - i. The need for ballasting [5 marks]
 - ii. The most common types of ballasts [4 marks]
 - iii. The limitations to the level of ballasting. [5 marks]
- c) Describe the following seed placement methods:
 - i. Precision planting, [3 marks]
 - ii. Drill seeding. [3 marks]

Question 2

- a) Describe the mode of function of the two most common types of agitators in sprayers. [5 marks]
- b) Discuss the recommended method of calibration of a boom sprayer. [10 marks]
- c) You are supplied with a TAURUS Knapsack sprayer fitted with LE 800 degree nozzle for band spraying. The sprayer is operated at a pressure of 15 psi which discharges 950 ml/minute of spray liquid. The chosen nozzle height gives a swath 0.5 m wide. The normal walking speed is 1 m/s.

- i. Calculate the area covered after spraying for 20 minutes. [5 marks]
- ii. Find the volume of spray liquid required to cover one ha. [5 marks]

Question 3

Discuss the emerging innovative and future technologies that can help to improve productivity on and off-farm whilst creating employment for the next generation in Zimbabwe. [25 marks]

Question 4

- a) Distinguish between field efficiency and performance efficiency. [5 marks]
- b) Outline five factors affecting the field efficiency and performance efficiency of a machine. [10 marks]
- c) Assuming a field efficiency of a plough to be 60% and theoretical capacity of 1.2 ha/hr what would be the expected effective field capacity? [5 marks]
- d) In applying fertilizer with a spinning disc broadcaster the data given in Table 1 were recorded. Calculate the field efficiency. [5 marks]

Table 1

Activity	Time (min)
Refilling hopper	12
Cleaning spinning disc & hopper	20
Actual fertilizer broadcasting	42
Turning time	20
Travel time	18

Question 5

- a) Explain the effect of the following adjustments on an disc plough:
 - i. Spacing between discs [3 marks]
 - ii. Horizontal angle [3 marks]
 - iii. Tilt angle [3 marks]
- b) List the advantages of a disc plough over a mouldboard plough. [7 marks]
- c) Outline three adjustments made on a disc harrow. [9 marks]

Question 6

- a) List the functions performed by a combine harvester. **[5 marks]**
- b) Describe the adjustments made on a combine harvester. **[10 marks]**
- c) Discuss the challenges faced by small scale farmers in using Harvesting machines like the combine harvester. **[10 marks]**