



MACHAKOS UNIVERSITY

University Examinations for 2022/2023 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (AGRICULTURAL EDUCATION AND EXTENSION)

AGN 374 FARM MACHINERY

DATE: 11/4/2023

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Explain any five objectives of tillage (5 marks)
- b) Describe any five parts of indigenous plough (5 marks)
- c) Drone technology has gotten most of the recognition in the industry because of its diversity and considered the future for the agrarian community. Explain five benefits of the drone technology in farming (10 marks)
- d)
 - (i) What seed spacing is required when planting corn in rows 102 cm apart if the desired plant population is 6000 plants per hectare and an average of 85 % emergence is expected?
 - (ii) If the edge drop seed plate has 16 cells and a diameter of 200 mm, what is the linear cell speed in meters per minute when planting at 8 km/h (10 marks)

QUESTION TWO (20 MARKS)

- a) Mechanized agriculture is the process of using agricultural machinery to mechanize the work of agriculture, greatly increasing farm worker productivity. Most of the developing countries has not embraced it for social aspect. Discuss the reasons behind it (6 marks)
- b) A tractor is pulling 10000 kg [22000 lb] sugar cane trolley at 8.05 km/hour [5.00 MPH]. The tractor mass is 8000 kg [17600 lb]. Find DBP
- i) when the tractor is moving on the level road
 - ii) When moving up fly over bridge. Assume the coefficient of rolling resistance is 0.6 for all wheels. (8 marks)
- c) The rotary cultivator is widely considered to be the most important tool. Describe the working principles (6 marks)

QUESTION THREE (20 MARKS)

- a) Explain any two methods of Plowing a Land (3 marks)
- b) Explain the working principles of the following tools
- i) Spring tooth harrow (3 marks)
 - ii) Bund former (3 marks)
 - iii) Ridger (3 marks)
- c) Explain six important functions performed by a cultivator (8 marks)

QUESTION FOUR (20 MARKS)

- a) Seeding or sowing is an art of placing seeds in the soil to have good germination in the field. Describe any four sowing methods (6 marks)
- b) Seed metering mechanism is a important task in increasing the productivity in farming operations. Explain any two seed metering mechanism that can be employed by farmers in Machakos County (6 marks)

- c) A 8-15 cm seed drill has a wheel of 50 cm diameter. The wheel shaft carries a 7 teeth sprocket which drives a 12 teeth sprocket on a counter shaft. Another 7 teeth sprocket on the countershaft drives a 12 teeth sprocket on a shaft carrying a seed plate with 4 cells on its periphery for dropping of single seed per cell.
- i) Calculate the total number of droppings along one row in 10 minutes if the tractor pulls the drill at 6.5 km/h.
 - ii) Determine the horse power required to pull the planter when the cross-section of the furrow is 8 cm x 7.5 cm and soil resistance is 0.8 kgf / cm² (8 marks)

QUESTION FIVE (20 MARKS)

- a) The land leveling in the farm is required operations. Explain four objectives of this operation (4 marks)
- b) Explain any six factors that affect the selection of a tractor (8 marks)
- c) The seed rate of a 10-20 cm seed drill was kept at 60 kg per hectare. The seed drill was jacked up to collect the seed for definite number of revolutions of the ground wheel. If the radius of the wheel is 25 cm and wheel slippage in the field is 15 %, then
 - i) Calculate the speed of travel for wheel speed of 75 rpm.
 - ii) What would be the rpm of wheel to cover 1/8 hectare.
 - iii) What would be correction factor to multiply the indicated value, if half of the grain drill drops 26 kg for the number of revolutions indicated in (b). (8 marks)