OLABISI ONABANJO UNIVERSITY
COLLEGE OF ENGINEERING & ENVIRONMENTAL STUDIES
FACULTY OF ENGINEERING

AGRICULTURAL ENGINEERING DEPARTMENT

2020/2021 HARMATTAN SEMESTER EXAMINATIONS

AEG 501 AGRICULTURAL MACHINERY I (3 Units)

Instruction: Answer Question 1 and any other three. Time: 2 ½ hrs Date: 18th August, 2021

Question 1(25 marks)

a. What do you understand by Agricultural Mechanization? **(2 marks)**

b. List the major sources of power on the farm for agricultural mechanization? Write short notes on any four **(7 marks)**

c. What are the advantages of Solar Power? **(2 marks)**

d. The human body is limited by a number of factors which is described by the equation highlighted below.

$T_r = 60(1 - 250/P)$

Identify the variables T_r and P in the expression **(2 marks)**

e. The power demand for various field activities is highlighted in table 1 below.

Table1: Power Demand for Various Farming activities

Activity	Gross Power Demand (Watts)
Bush and Scrub clearing	600
Tree felling	600
Hoeing	3500
Ridging, deep digging	1000

Required: Calculate the appropriate rest period in Minutes for each activity. Comment on your result for each finding. What is the implication of the gross power demand on the rest period in general? **(12 marks)**

Question 2 (15 marks)

a. What do you understand by Land clearing? **(3marks)**

b. When is the best time for land clearing? **(2marks)**

c. What are the four general methods used in land clearing for agricultural purposes? **(5marks)**

d. List any five land clearing equipment that you know of. **(5marks)**

Question 3 (15marks)

a) Define the term 'Tillage'. **(1 mark)**

b) State the objectives of tillage operation. **(4 marks)**

c) Differentiate between primary and secondary tillage. Give four examples of equipment for each type of tillage. **(6 marks)**

d) State five types of Tillage **(5 marks)**

Question 4 (15marks)

a. A two-bottom tractor drawn mouldboard plough moved a distance of 50metres in 30 seconds while ploughing. The dynamometer indicated an average draft of 1200kgf. Calculate the drawbar horse power developed and the forward speed in km/hr. **(6 marks)**

b. Define the following terms for a typical plough:

i. Centre of resistance

ii. Disc angle

iii. Tilt angle

iv. Draft **(4 marks)**

c. Enumerate the factors affecting the draft of a plough. **(2 marks)**

d. An indigenous plough cuts 20 cm wide wide furrow at the top and 10cm depth. Calculate the volume of soil, cut per day of 8hrs, if the speed of plough is 2.5km/h. **(3 marks).**

Question 5 (15marks)

a. Total draft of a four bottom, 40cm MB plough when ploughing 15cm deep at 6kmph speed, is 1800kg.

i. Calculate unit draft kg/cm^2, **(2 marks)**

ii. Actual power requirement, **(2 marks)**

iii. If efficiency is 80%, what is the rate of doing work in ha/h **(2 marks)**

b. Explain the following adjustments that is normally done on a moldboard plough.

i. Throat clearance

ii. Horizontal suction (Horizontal clearance)

iii. Vertical suction (Vertical clearance)

iv. Plough size **(4 marks)**

c. What is the purpose of strain gauge in field implements? **(2 marks)**

d. Explain the operating functions of a typical moldboard plough **(3 marks)**

Question 6 (15marks)

a. What is an instrument? **(2 marks)**

b. What are the major parameters of interest that are measured in field implements? **(2 marks)**

c. What is a drawbar dynamometer? What are the three commonly used types of drawbar dynamometer? **(4 marks)**

d. Find the horsepower developed by a pair of bullocks in pulling up No 2 ploughs at the forward speed of 3kmhre. The plough makes a furrow of 20cm wide and 11 cm deep. The dynamometer indicates an average draft of 85kgf. **(5 marks)**

e. What will be the unit draft? **(2 marks)**

Hint: $HP = \dfrac{Draft(kgf) \times dis\tan ce(ms^{-1})}{75}$