



**COLLEGE OF AGRICULTURE, FISHERIES & FORESTRY
SCHOOL OF AGRICULTURAL SCIENCES**

DEPARTMENT OF ADMINISTRATION, AGRICULTURAL ENGINEERING AND STATISTICS

FINAL EXAMINATION

TRIMESTER 1, 2017

BACHELOR OF SCIENCES (AGRICULTURE) – YEAR 2

AEG 601 FARM MECHANIZATION AND MACHINERY

Time Allowed : 3 hours and 10min

Instructions

1. You are allowed 10 minutes Extra reading time during which you are NOT to write.
2. Begin each answer on a fresh page and use both sides of the sheet.
3. Do not write your name on any answer sheet - only write your examination number.
4. Insert all written sheets, graph paper, drawing paper, etc. in their correct sequence and secure with string.
5. For all sheets of paper of which rough/draft work has been done, cross it through And you **MUST ATTACH** to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Non-programmable calculators are permitted
8. **TOTAL MARKS = 100**

SECTION	DESCRIPTION	Marks
SECTION A	Part 1 – MCQ	10
	Part 2 – True and False	10
	Part 3 – Fill in the blanks	5
	All question in this section are Compulsory	
SECTION B	Short Answer and Essay Question Answer any four (4) question from this section	40
SECTION C	Calculations All question in this section are Compulsory	35
	TOTAL	100

SECTION – A

Part 1

1. The engine in which liquid fuel is atomized, vaporized and mixed with air in correct proportion before entering into the engine cylinder
(A) Two stroke engine (B) Four stroke engine
(C) Diesel engine (D) Petrol engine
2. When the cycle is completed in two revolution of the crankshaft
(A) Four stroke engine (B) Two stroke engine
(C) Petrol engine (D) Diesel engine
3. When the cycle is completed in one revolution of the crankshaft
(A) Two stroke engine (B) Four stroke engine
(C) Diesel engine (D) Petrol engine
4. The rate of doing work at the rate of 4800 N-m per minute
(A) 820Hp (B) 8Kw
(C) 800Kwh (D) 80w
5. The rate of doing work
(A) Power (w) (B) Energy (j)
(C) Heat (j) (D) Capacity (m³)
6. The tractor drawn rotavator is an excellent
(A) Rotary Secondary tillage implements (B) Rotary primary tillage implements
(C) Rotary tillage implements (D) Mulching tillage implements
7. What is the main functional part of the sowing machine?
(A) Seed box (B) Seed tube
(C) Seed metering mechanism (D) All of the above
8. Rotavator work on the principle of
(A) Rotary motion (B) Vibrating motion
(C) Reciprocating motion (D) none of the above
9. Which of the following types of tynes are used in rotavator
(A) L shaped (B) U shaped
(C) V shaped (D) none of the above
10. The width of cut of disc plough is given by
(A) $W = Dd/3$ (B) $W = D/3$
(C) $W = Dp$ (D) $W = Dd/2$

Part 2

In the Answer booklet provided write “TRUE if the statement is correct and “FALSE” if the statement is incorrect

1. Camshaft is the main shaft of the engine which rotates during power stroke.
2. Solid fertilizer is more effective than liquid fertilizer
3. The two revolution cycle is completed in of the crankshaft of 4-stroke engine
4. Exhaust valve opens during the compression stroke of a diesel engine.
5. Petrol engine uses fuel injector as the delivery mechanism for fuel.
6. Regular maintenance of the farm machine is not always required
7. Primary tillage involves breaking down large clods of soil into smaller pieces.
8. Screwdriver is a device specifically designed to insert and tighten, or to loosen and remove, screws
9. Diesel engines come in two and four stroke versions.
10. Exhaust fumes contain carbon – monoxide a poisonous gas. Always open the workshop doors and windows when the engine is running.

Part 3

1. The machine call _____ can perform cutting threshing and cleaning operation together.
2. _____ is an ancient agricultural hand tool used to shape the soil, control weeds, and harvest root crops. (Hilling), creating narrow furrows (drills) and shallow channels for planting seeds.
3. How much of energy consumed by 350w electric motor worked for 15 minutes _____
4. A _____ is a room or building which provides both the area and tools or machinery that may be required for the repair and maintenance of farm machinery and equipment.
5. Piston is connected to the connecting rod by _____

Section B

Short Answer and Essay type Question

Answer **any 4** questions from this Section

Question 1.

1. Define the term “Farm Mechanization”. (2marks)
2. List three (3) objectives of farm mechanization. (2marks)
3. Briefly explain, why we need to mechanize farm operations. (4marks)
4. List disadvantages of farm mechanization. (2marks)

Question 2.

1. With the help of a neatly labeled diagram, explain the operation of a four stroke cycle in petrol engine. **(6marks)**
2. Make the table, advantage and disadvantage of two –stroke engine **(2marks)**
3. Compare differences between a petrol and diesel engine. **(2marks)**

Question 3.

1. Define the farm power **(2marks)**
2. List any three (3) safety procedures which must be observed in a workshop.**(3marks)**
3. List any four (4) renewable sources of power on a farm. **(1marks)**
4. 4-wheel tractor is used for plowing paddy field, force required for plowing was measured 6KN and plowing speed was 8km/h calculate the energy output of the tractor by horse power (HP) (1HP = 746W) **(4 marks)**

Question 4.

1. Make the list of use of farm tractor in agriculture. **(2marks)**
2. List three (3) factors that you would consider when selecting a tractor for your farm. **(2marks)**
3. List pre-start checks you would do prior to starting a tractor. **(2marks)**
4. Explain power transfer mechanisms of modern vehicle **(4marks)**

Question 5.

1. Define the term soil tillage. **(2marks)**
2. List any three (3) objectives of soil tillage and name any two types of mouldboard plough.**(3marks)**
3. Name any three (3) secondary tillage implements and state their usage in the field. **(3marks)**
4. Name the implement which has serrated concave discs whose primary purpose is to break up large clods of soil during secondary tillage operations. **(2marks)**

Question 6

1. Explain the importance of mechanical fertilizer application **(2marks)**
2. Explain the parts of knapsack sprayer **(3marks)**
3. What are the application forms available in pesticide & herbicide, explain importance of these forms. **(2marks)**
4. Explain fix and variable cost of farm tractor **(2marks)**

SECTION D

All Questions are Compulsory

Question 1

- a) Gear mechanism is used to transmit engine power to wheel. Small sprocket (radius R) is coupled to the engine and small sprocket connected to the large sprocket (radius $4R$) by the chain. The large sprocket was fixed to wheel (diameter 70cm). Calculate the number of revolutions need to be rotated of small sprocket to travel 4.4km of wheel (5 marks)
- b) A rotary cultivator having 12 blades spaced at 20cm apart is mounted on a tractor with a forward speed of 6 km/h covers an area of 5 hectares in 6 hours. Calculate the field efficiency of the rotary cultivator (5 marks)

Question 2.

- a) Calculate the farm house operational electricity cost per month, if farm house has 8W bulbs switch on 12 hours/day for 30 days and electric motor 1.12kW operate 4 hours/day for 20days per month (30 days) Consider one electric unit = 1kWh (kilo watt hour) 1kWh cost \$ 0.40 (7marks)
- b) Calculate the cost of operation of a tractor per hour. If Initial cost is F\$ $60,000$, Life of the tractor is 10 years, Number of working hours are 1200 per year, Interest on the capital is 10%, Cost of the diesel is F\$ 2.50 per litre, Fuel consumption is 5 litres per hour, Wages of the driver is F\$ 5 , Lubricants cost is 35% of the fuel cost, Repairs and replacements is 10% of initial cost, Housing, Taxes and Insurance is 1.5% each of the initial cost. (8marks)

Question 3.

A five hectare farm is to be sprayed with a 16 liter knapsack sprayer which has a swath width of 550mm and a discharge of 600ml/min . The cost of the pesticide is $\$25/\text{L}$ and its application is 15ml/liter .

- a) Calculate the volume of spray in liters required per hectare if the walking speed or the spray man is 20m/min (2marks)
- b) How many tank loads of spray is required for this farm? (2marks)
- c) Calculate the amount of pesticide required per knapsack (2marks)
- d) What would be the total cost of spraying this farm? (2marks)

THE END

