

071906T4AEN

AGRICULTURAL ENGINEERING LEVEL 6

ENG/OS/AGR/CR/05/6/A

Demonstrate Understanding of Tractors and Power Units

March/April 2025



**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION
COUNCIL (TVET CDACC)**

WRITTEN ASSESSMENT

INSTRUCTIONS TO CANDIDATE

1. This paper consists of **TWO** sections: **A** and **B**.
2. Answer **ALL** questions in section A and **ANY THREE** (3) questions in section B.
3. Marks for each question are indicated in the brackets.
4. Candidates are provided with a separate answer booklet
5. Do not write on the question paper.

This paper consists of FOUR (4) printed pages
Candidates should check the question paper to ascertain that all
pages are printed as indicated and that no questions are missing.

SECTION A (40 MARKS)

Attempt ALL the questions in this section.

1. A tractor is a self-propelled power unit having wheels or tracks for operating agricultural implements and machines including trailers. Differentiate between crawler and wheeled tractors. (2 Marks)
2. A tractor clutch is a device, used to connect and disconnect the tractor engine from the transmission gears and drive wheels. State ONE function of each of the following tractor power train components. (4 Marks)
 - a. Crank shaft
 - b. Gear box
 - c. Differential
 - d. Final drive
3. Too low fuel pressure to the injection pump, makes it very difficult to start a diesel engine, and the maximum power is reduced. Outline FOUR causes of too low fuel pressure. (4 Marks)
4. A system, which controls the engine temperature, is known as a cooling system. Outline FOUR reasons for efficient cooling combustion engine. (4 Marks)
5. Tractors are the main cause of accidental deaths on farms. Outline FOUR safety rules to observe when operating a tractor. (4 Marks)
6. **Figure 1** shows a typical diesel engine pressure indicator diagram. Identify the stages labeled ABCD. (4 Marks)

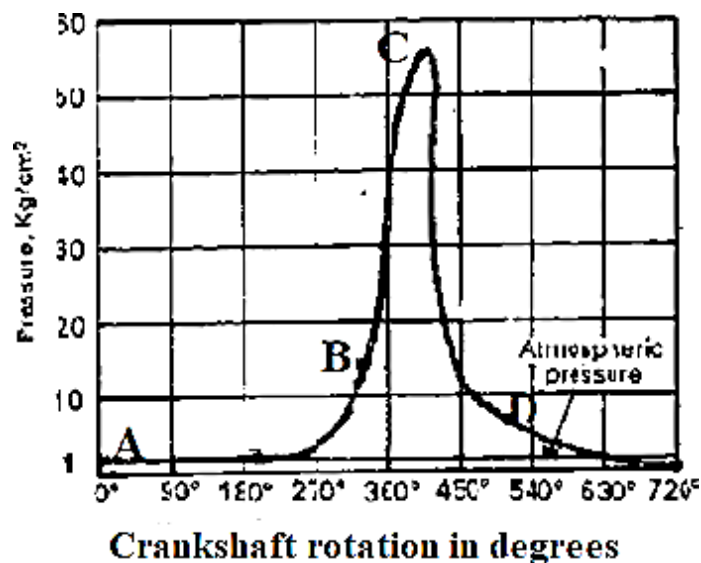


Figure 1

7. Ignition quality refers to ease of burning the fuel in the engine combustion chamber. Define the following terms used to measure the ignition quality of fuel. (2 Marks)
- (a) Octane number.
 - (b) Cetane number.
8. The internal combustion engine is made of many moving parts. Outline FOUR functions of the tractor engine lubrication system. (4 Marks)
9. Tractors often have large engines which require relatively high amounts of electrical current for starting. Name FOUR maintenance practices carried out on the tractor electrical system. (4 Marks)
10. The economics of choosing and using farm tractors is influenced by many factors. Enumerate FOUR factors that influence the choice and use of farm tractors. (4 Marks)
11. Mr. Kamau was advised to purchase tractor three-point hitch implements because they are cheap and do not require to have wheels. Outline FOUR functions of the tractor three-point hitch system. (4 Marks)

SECTION B (60 MARKS)***Attempt Any THREE Questions in This Section***

12. A heat engine is a device that converts heat into mechanical energy that can be used to do work. In the case of internal combustion engine, the combustion of fuel takes place inside the engine cylinder itself.
- a. Illustrate the opening and closing mechanisms of overhead valves of an internal combustion engine. (10 Marks)
 - b. Explain the following engine terminologies.
 - i. Stroke length.
 - ii. Clearance volume.
 - iii. Compression ratio. (6 Marks)
 - c. Outline FOUR advantages of a two-stroke cycle over four-stroke cycle engines. (4 Marks)
13. The operating efficiency, good performance and durability of an engine depend mainly upon its cleaner.
- a. Using a diagram, Describe the operation of an oil bath air cleaner. (14 Marks)
 - b. Outline SIX maintenance
14. The steering system is required to control the direction of motion of a tractor.
- a. Using a diagram, Describe the operation of a manual tractor steering system. (15 marks)
 - b. Describe FIVE advantages of power steering over manual steering systems (5 Marks)
15. Traction is the process by which a tractor develops tractive force and overcomes motion resistance to produce desired motion.
- a. Explain the following terminologies used in tractor wheel traction. (5 Marks)
 - i. Tractive force.
 - ii. Motion resistance.
 - iii. Rolling resistance.
 - iv. Sinkage.
 - v. Slip.
 - b. Discuss SIX methods of increasing tractor wheel traction. (12 Marks)
 - c. Outline THREE problems of tractor tire under inflation. (3 Marks)