

CHUKA



UNIVERSITY

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**EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF
SCIENCE IN ANIMAL SCIENCE**

AGEN 131: BASIC FARM POWER SOURCE AND UTILIZATION

STREAMS: BSC. ANSC (Y2S1)

TIME: 2 HOURS

DAY/DATE: FRIDAY 13/12/2024

2.30 P.M. – 4.30 P.M.

INSTRUCTIONS

- Answer **ALL** questions in **Section A** and any other **Two** questions in **Section B**
This paper contains **SEVEN** questions
- Answer **ALL** questions in section A and any **TWO** questions in sections B.

SECTIONS A (30 marks)

QUESTIONS ONE

- a) Define the following terms in an internal combustion engine
- Piston displacement (Pd) (2 marks)
 - Compression ratio (CR) (2 marks)
 - Stroke (2 marks)
- b) The coefficient of traction (C_t) on a dry clay soil for a wheel type tractor is 55%. The load (W_r) on the driving wheels is 1200 kg, without wheel weights and 1500 kg, with wheel weights Determine the traction force (F) for the tractor without wheel weight and with wheel weights (4 marks)

QUESTION TWO

Briefly discuss four functions of the engine lubricating oil as it circulates within the engine
(8 Marks)

QUESTION THREE

- a) Explain the function of the transmission clutch in a tractor (3 marks)
- b) With the aid of a diagram name the basic parts of a clutch in a tractor (3 marks)

QUESTION FOUR

- a) Explain four differences between the spur gears and the helical gears (4 marks)
- b) Explain the purpose of an idler gear in a gear drive train (2 marks)

SECTION B (40 MARKS)

QUESTION FIVE

- (a.) Discuss three factors to consider when matching tractor and implement (6 marks)
- (b.) A gearbox is driven in second gear where the constant-mesh gears on the clutch shaft and the countershaft gear have 18 and 35 teeth respectively.

The second gear on the main shaft has 32 teeth and meshes with the countershaft gear having 16 teeth. Determine the following for this gearbox;

- i. The second gear ratio. (4 marks)
- ii. The propeller shaft speed for an engine speed of 3600 rpm. (4 marks)
- c.) Discuss three functions of hitching device of a tractor. (6 marks)

QUESTION SIX

- a) Describe the construction materials in the clutch/brake lining (4 marks)
- b) A freshly tilled soil has a bulk density of 1.05gm/cm^3 and a moisture content of 25%. A tractor wheel packs the soil to a density of 1.6gm/cm^3 .
Assuming no loss of water from the soil, calculate the reduction in air-filled pores caused by the tractor wheel. The particle density of the soil is 2.65gm/cm^3 . (10 marks)
- c) Define the following terms related to fuels.
 - i. Flashpoint (3 marks)
 - ii. Ignition temperature (3 marks)

QUESTION SEVEN

- a) (i.) Define the term wheelslip as related to the performance of a farm tractor. (3 marks)
 - (ii.) List four negative effects of wheelslip on tractor performance (4 marks)
 - b) Discuss five advantage of power transmission by belts and pulleys as compared to power transmission by gears, and chains and pockets. (5 marks)
 - c) A generator is belt-driven at 4,000 revolutions per minute from a crankshaft pulley of 14-centimetre diameter. The crankshaft pulley is revolving at 3,500 revolutions per minute. Calculate the following for this drive system.
 - i. The linear speed of the belt in metres per minute. (5 marks)
 - ii. The diameter of the generator pulley. (3 marks)
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