



**UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER**

**PROGRAMME: DIPLOMA IN AGRICULTURE 2
DIPLOMA IN AGRICULTURAL EDUCATION 2**

COURSE CODE: LUM 201

TITLE OF PAPER: FARM POWER

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: NONE

**INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER
QUESTIONS.**

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GRANTED BY THE CHIEF INVIGILATOR**

SECTION I
COMPULSORY

QUESTION 1

- a) Most tractor operations on Swazi Nation Land (SNL) are performed during the growing season only. The tractor stands idle for most of the year during the off-season period. Advise a Swazi farmer on the best way to keep tractor tyres when the tractor is idle so that they can last as long as possible;

[10 Marks]

- b) Swaziland is located in the subtropical belt of the world. Therefore, it does not receive extreme low temperatures in winter. Why is it still necessary to use anti-freeze in the cooling system of internal combustion engines used in Swaziland?

[10 Marks]

- c) What constitutes good care of a battery on an agricultural tractor?

[10 Marks]

- d) A tractor engine is rated at 64 kW, 2200 rpm.

Calculate:

- i) the torque developed by the engine at the flywheel at rated speed.
- ii) the torque of a similar engine that develops the same power but at 1800 rpm.

[10 Marks]

SECTION II**CHOOSE ANY TWO QUESTIONS FROM THIS SECTION.****QUESTION 2**

Write short comments on following common practices by farmers:

- a) Tractors should be refuelled in the morning before going out for farm operations.

[7 Marks]

- b) Thermostats are usually removed from engine cooling systems to solve overheating problems.

[8 Marks]

- c) It is normal for diesel powered engines to emit black smoke from the exhaust systems.

[8 Marks]

- d) Diesel engines are stronger than petrol engines

[7 Marks]**QUESTION 3**

- a) What precautions would you take to avoid a condition known as “clutch drag”, which makes it difficult to change gears on tractors? **[10 Marks]**

- b) Figure 1 shows the components of a drive train of a tractor power transmission system. Table 1 shows the transmission data from the technical specifications of the operator’s manual for the components in Figure 1.

Calculate:

- i) the speed of the rear driven wheels, in revolutions per minute, if the engine is running at 1500 rpm and gear number 4 has been selected;

- ii) the forward speed of the tractor in km/h, if the tractor is fitted with 16.9/14 – 30 tyres and assuming that there is no slip on the ground and the aspect ratio is 80%.

[20 Marks]

Table 1: Gear Ratio for the drive train of a tractor.

Drive Component	Gear Ratio	
Gearbox	Gear 1	8.0:1
	Gear 2	7.0:1
	Gear 3	6.0:1
	Gear 4	5.0:1
	Gear 5	4.0:1
	Gear 6	3.0:1
	Gear 7	2.0:1
	Gear 8	1.0:1
Differential	8.0:1	
Final Drive	5.0:1	

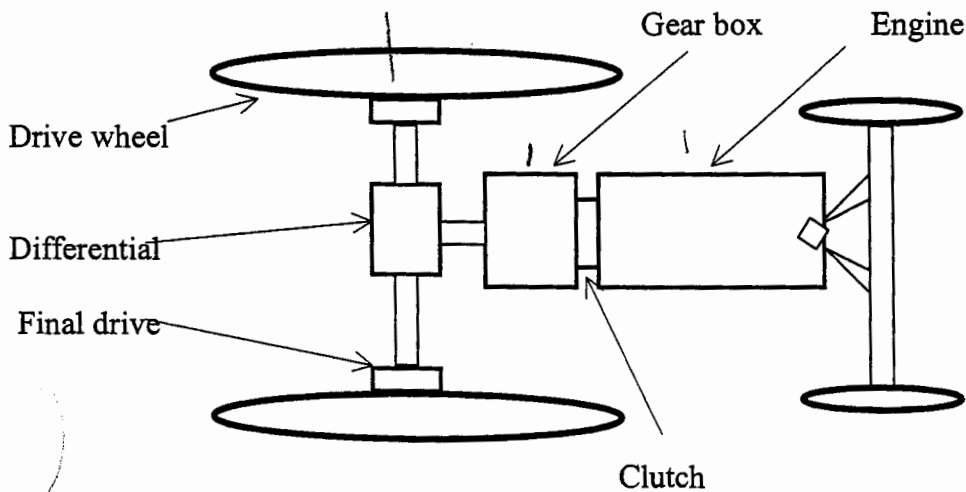


Figure 1 The drive train of a tractor power transmission.

QUESTION 4

a) Name the electrical subsystems found on tractors.

[6 Marks]

b) What are the roles of the electrical subsystems in a) on a tractor?

[12 Marks]

c) Figure 2 represents the circuit for dashboard light. The 12 V battery supplies a current through the 5Ω -fuse, and then the bulb marked 8V 2W, which is connected in series with a variable resistor, R. The variable resistor is used to adjust the intensity of light on the dashboard. If the bulb is lighting brightly at its rating, calculate:

- (i) the current supplied from the battery;
- (ii) the value of the setting of the variable resistor.

[12 Marks]

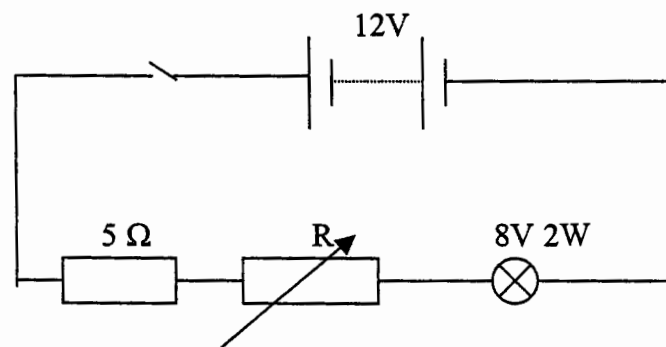


Figure 2 Lighting circuit for a tractor dashboard