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UNIVERSITY OF SWAZILAND FINAL EXAMINATION PAPER

PROGRAMME: BSC ABE. II

COURSE CODE: ABE205 / ABE 203

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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SECTION I COMPULSORY

QUESTION 1

- a) State examples of solar energy use for agricultural production in rural communities of Swaziland. [8 marks]
- b) Figure 1 show hitching components of a farm tractor. Name the elements labelled in the figure. [12 marks]



Figure 1 Hitching components of a wheeled tractor.

- c) Figure 2 shows a Tractor Loader and Backhoe (TLB) and its schematic diagram for the power flow from its internal combustion engine to the cylinder for the bucket loader and to the hydraulic motors that are driving the wheels. If a torque of 254.65 Nm is delivered by the engine when running at 1500 rpm, calculate
 - i) The discharge from the pump when the pressure p is 20 MPa. [5 marks]
 - ii) The speed of the bucket when the cylinder diameter is 20 mm. [5 marks]
 - iii) The maximum load that can be lifted when TLB is not moving [4 marks]
 - iv) The torque that can be generated by the motor driving the two rear wheels of the TLB if the wheels rotate at 75 rpm and the load held level. [6 marks]



a) Backhoe Tractor Loader b) Power flow in a TLB Figure 2 Flow of power in a backhoe tractor loader

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SECTION II ANSWER ANY TWO QUESTIONS

QUESTION 2

- a) Discuss the preference of diesel engines to petrol engines in agricultural tractors. [10 marks]
- b) A farmer consults an extension officer for advice on the choice of tractor that would be suitable on land that is marshy and predominantly clay.
 - i) What type of tractor(s) is most suitable? [4 marks]
 - ii) Give reasons for the choice of tractor in i) above. ` [6 marks]
- c) Explain the prestart checks a farmer should conduct on a tractor before setting out for field operations in the morning. [10 marks]

QUESTION 3

- a) State the functions of transmission systems in farming operation? [5 marks]
- b) Figure 3 shows the arrangement of gears responsible for transmission when the gear selection lever of a gearbox is at position 1. Calculate
 - i) The gear ratio for the mechanism

[6 marks]

ii) The number of rotations of the output shaft D when input shaft rotates at 3000 rpm. [5 marks]



Figure 3 Gears for transmission in gear 1

c) Discuss the advantages and limitations of using belt drives over chain drives in agricultural operations. [14 marks]

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QUESTION 4

a) Briefly describe the features of tractors that are classified as four wheel drive.

[5 marks]

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- b) An engine oil can has the inscription SAE10W40. What is the interpretation of these letters and numbers? [5 marks]
- c) The sidewall of a tractor tyre has the inscription 235/75 R 15 10 PR. i)What do the following inscriptions mean?

1. 235	[2 marks]
2. R	[2 marks]
3. 15	[2 marks]
4. 10 PR	[2 marks]

ii) Determine the section height of the tyre described in (i) [5 marks] iii)Briefly describe the best practice for tyre storage on a farm. [7 marks]