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**UNIVERSITY OF SWAZILAND**  
**FINAL EXAMINATION PAPER**  
2017

PROGRAMME: **B.Sc. in AGRICULTURAL and BIOSYSTEMS ENGINEERING 2**

COURSE CODE: **ABE209**

TITLE OF PAPER: **FIELD AND FARMSTEAD POWER**

ALLOWED TIME: **TWO (2) HOURS**

SPECIAL MATERIAL REQUIRED: **CALCULATOR.**

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

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**THE CHIEF INVIGILATOR**

## SECTION ONE: COMPULSORY QUESTION

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## QUESTION 1

- a) State whether the following statement is true or false. A man pushes against the wall with a 20 000 N force for 4 hours (14 400 s). The power developed by the man is 1.39 J/s. {2marks}
- b) The discovery of tools led to the development of machines. This helped to commercialise Agriculture. Discuss the key major effects of machines on Agriculture. {4marks}
- c) Give three advantages and three disadvantages of the use of rubber tyres in Agricultural machines. {6marks}
- d) Define the following terms used in the farm and give an example in each case. {9marks}
- i) Renewable resource
  - ii) Sustainable resource
  - iii) Non-renewable resource
- e) Give three reasons why electricity is the most common source of power in Swaziland. {7mark}
- f) Discuss briefly the processing of the following energy sources on the farm. {12marks}
- i) Petroleum
  - ii) Biodiesel
  - iii) Ethanol
  - iv) biogas

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**QUESTION 2**

- a) A car of mass 2500 kg travelling at 40 m/s has its speed reduced to 10 m/s by a constant braking force over a distance of 85 m.

Find:

- i) The cars initial kinetic energy {5marks}  
ii) The final kinetic energy {5marks}  
iii) The breaking force {5marks}
- b) Suppose you want to connect your stereo set to a remote speaker. If each must be 30 m long, what diameter of copper wire (resistivity  $1.7 \times 10^{-8}$  ohm.m) should be used to keep the resistance less than 0.10 ohm per wire. {10marks}
- c) A 70 kg man runs up a long flight of stairs in 4.0 s. The vertical height of the stairs is 4.5 m. Calculate his power output. {5marks}

**QUESTION 3**

- a) To obtain power from a wind turbine, the designer must pay particular attention to four key characteristics. Name and discuss how each help contribute to optimum power production of the wind vane. {12marks}
- b) Renewable energy sources have been proven scientifically to be environment friendly. Discuss three main reasons why countries like Swaziland cannot take full advantage of such nature's gift. {12marks}
- c) A student connects a bedside lamp, a heater and an iron on the same wall socket rated 120 volts. If the plug is connected to a 20 Amps fuse, what would happen to the circuit if the lamp is rated 100 Watts, the heater 1800 Watts and the iron 1300 Watts. {6marks}

**QUESTION 4**

- a) A farmer rests a two metre high (5, 000 Litre) water tank on a three meter stand to provide water to his vegetable garden. If he uses a sprinkler that is one metre high, calculate the potential energy of the water in the tank when it is full. {6marks}
- b) What is wind? What are the three major causes of wind? {8marks}
- c) State the difference between a wind mill and a wind turbine. {4marks}
- d) Give three advantages and three disadvantages of wind power on the farm. {12marks}