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**UNIVERSITY OF SWAZILAND**  
**FINAL EXAMINATION PAPER**  
2016

PROGRAMME: B.SC.

COURSE CODE: ABE 209

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****QUESTION 1**

- a) Define the following terms used in the Farm. {24marks}
- i) Renewable resource
  - ii) Non-renewable resource
  - iii) Sustainable energy
  - iv) Mechanical energy
  - v) Electrical energy
  - vi) Thermal energy
- 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. {4marks}

**SECTION TWO: ANSWER ANY TWO QUESTION****QUESTION 2**

- a) Discuss four reasons why human power is a disadvantage on the farm. {8marks}
- b) Suppose you want to connect your stereo set to a remote speaker. If each must be 20 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. {8marks}
- c) A cyclist and his bicycle has a mass of 80 kg. After 100 m he reaches the top of a hill, with a slope of 1:20 measured along the slope, at a speed of 2 m/s. He then free wheels the bottom 100 m to the bottom of the hill where his speed has increased to 9 m/s.
- i) How high is the hill. {3marks}
  - ii) What is the potential energy lost. {3marks}
  - iii) What is the increase in kinetic energy. {5marks}
  - iv) How much energy did he loose at the bottom of the hill. {3marks}

**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 the wind vane. {12marks}

- b) A horse is towing a canal boat, the towrope making an angle of  $10^\circ$  with the tow path. If the tension in the rope is 20 N, how many joules of work are done while moving 50 m along the tow path. {5marks}
- c) A constant force of 2kN pulls a crate along a level floor a distance of 10 m in 50s. What is the power used? {5marks}
- d) An electric heater draws 15 Amps from a 120 Volts line.
- How much power does it use? {3marks}
  - How much does it cost per month (30 days) if it operates 3.0 hour per day and electricity costs E0.06 per kwh. {5marks}

#### QUESTION 4

- a) Discuss four advantages and five disadvantages of wind as a source of supplying power to the farm. {18marks}
- b) A farmers purchase two 10,000 litre tanks. If he plans to irrigate his crops giving them 8 mm in a day, how much land can he irrigate in a day. {4marks}
- c) A man holds a ball of mass  $m = 0.2$  kg at rest in his hand. He then throws the ball vertically upwards. In this process, his hand moves up 0.5 m before the ball leaves his hand with an upward velocity of 20 m/s. Assuming  $g = 10 \text{ m/s}^2$
- Find the kinetic energy of the ball when it leaves the hand. {2marks}
  - Find the work done of the upward movement. {2marks}
  - Find the highest point reached by the ball {4marks}