1st SEM.2011/2012

UNIVERSITY OF SWAZILAND
SUPPLEMENTARY EXAMINATION PAPER

COURSE CODE: ABE 203

TITLE OF PAPER: - FARM POWER

BSc. AGRICULTURAL & BIOSYSTEMS ENGINEERING.
Year 2.

TIME ALLOWED: TWO (2) HOURS

SPECIAL MATERIAL REQUIRED: CALCULATOR

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY TWO OTHER QUESTIONS.

DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE CHIEF INVIGILATOR

1st SEM.2011/2012

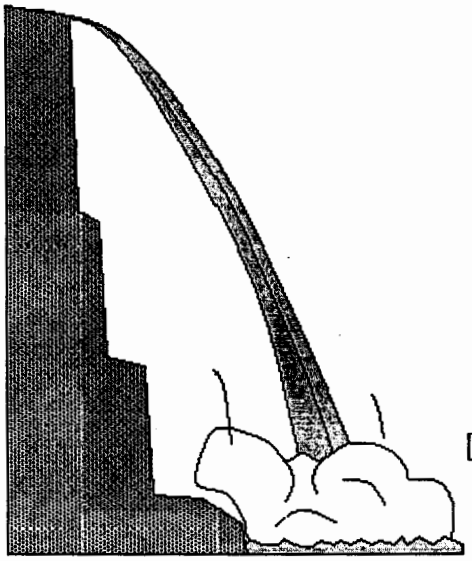
SECTION ONE: COMPULSORY

QUESTION ONE

(a) State the second Millennium Development Goal (MDG2) and explain how improved access to energy would help to achieve this goal. **(5 Marks).**

(b) Figure 1 below shows a dam wall 84 m in height. As the water falls to the bottom, the potential energy it had at the top of the dam wall is converted to kinetic energy that finally becomes heat energy as the water hits the bottom. Assuming there is no loss of energy to any other forms; calculate the rise in temperature of the water of mass **m** kg falling over the dam wall. [*Specific heat capacity of water = 4200 J/(kg°C), Gravitational field of the Earth = 10 N/kg*]

(5 Marks)



[Hint Q = $mc\,\delta\,\theta$]

(c) Define ergonomics **(5 Marks)**

(d) Discuss the importance of ergonomics in working environments. **(5 Marks)**

(e) State five *(5)* causes of excessive fuel consumption in engines. **(5 Marks)**

(f) Why is operation of tractors at smallholder farmer level not as efficient as at large scale commercial estates? **(5 marks)**

(g) Giving examples differentiate renewable energy from non-renewable energy **(5 Marks).**

(h) What is biogas? **(2 Marks)**

(i) List the gases that constitute biogas. **(3 Marks)**

(g) Giving examples differentiate renewable energy from non-renewable energy **(5 Marks).**

(h) What is biogas? **(2 Marks)**

(i) List the gases that constitute biogas. **(3 Marks)**

1st SEM.2011/2012

SECTION II: ANSWER ANY TWO QUESTIONS

QUESTION TWO

(a) Discuss the following factors that lead to farm machinery accidents on farms and indicate how each factor can be improved to prevent accidents.

i. Human related factors,

ii. Working environment related factors,

iii. Supervision related factors

(15 Marks)

(b) A stationary four-cylinder, four –stroke engine has a cylinder bore of 250 mm, a stroke of 500 mm, compression ratio of 16:1 and runs at 154 revolutions per minute. **(15 Marks)**

(i) How many times does the engine fire (go on power stroke) in a minute?
(ii) Calculate the distance moved by the piston between the top dead centre (TDC) and the bottom dead centre (BDC) in a minute.
(iii) Calculate the piston speed in metres per second
(iv) Calculate the displacement volume
(v) Calculate the clearance volume

QUESTION THREE

(a) Discuss the factors that contribute to reduced interest in using draught animal power in Swaziland. In your own opinion, what are the possible options of reviving use of draught animals in the country? **(15 Marks).**

(b) An oil can is inscribed SAE10W40. What information is communicated by these letters and figures? **(5 Marks)**

(c) With the aid of a sketch diagram, describe the diesel fuel system indicating pressure differences in the fuel lines **(10 Marks)**

QUESTION FOUR

(a) State the first law of thermodynamics **(3 Marks).**

(b) List five common causes of engine overheating **(5 Marks)**

(c) How many joules of energy are consumed by a 60 W light bulb in a second?
(2 Marks).

(d) Swaziland Electricity Company proposes to increase electricity charges for smallholder irrigation schemes to 46.02 c/kWh with effect from 1st August 2012. How much will be the monthly electricity bill for a smallholder irrigation scheme that consumes **7823 MJ** of electrical energy per month?
(1 MJ =1,000,000 Joules)
(5 Marks).

(c) Discuss the opportunities and challenges of using mules as draught animals in Swaziland. **(15 Marks)**