UNIVERSITY OF SWAZILAND
SUPPLEMENTARY EXAMINATION PAPER

PROGRAMME: BSC ABE. II

COURSE CODE: 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) Name the four basic parts of an internal combustion engine and their functions in the engine.   [8 marks]

b) Define the following terms as they apply in internal combustion engines.
   i)   Stroke
   ii)   Cylinder bore
   iii)   Piston displacement
   iv)   Clearance volume
   v)   Compression ratio

            [10 marks]

c) Distinguish between two and four stroke internal combustion engines.

            [6 marks]

d) The data in Table 1 was extracted from the sales pamphlet of a tractor dealer in Matsapha.

   Calculate:

   i)   the piston displacement;

   ii)   the total piston displacement from all the cylinders;

   iii)   the clearance volume per cylinder;

   iv)   compare the engine capacity with total piston displacement.

            [16 marks]

Table 1.   Engine Data

Bore	98.4 mm
Stroke	127.0 mm
Number of cylinders	4
Engine Capacity	3.86 L

SECTION II – ANSWER ANY TWO QUESTIONS

QUESTION 2

a)   Name any **FIVE** animal species used for draught work and indicate the type of work each species is most suited for.

[10 marks]

b)   List and explain cattle conformation features that influence their potential use in draught work.

[10 marks]

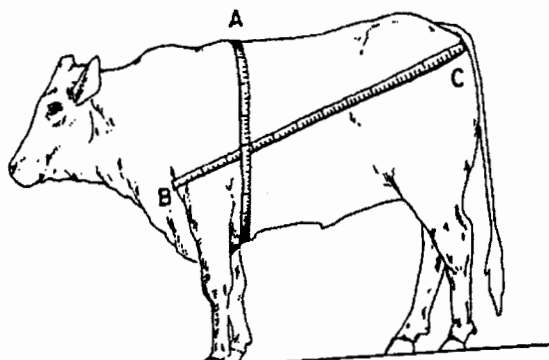b)   An ox shown in Figure 1 has a girth of 1800 mm and a length of 1500 mm.

Figure 1   measurements on an ox (A=Girth, BC=Length)

i.   Estimate the mass of the ox using the formula
$$m = \frac{G^2 L}{10816}$$

[7 marks]

Where   m = mass (kg)
         G = girth (cm)
         L = length (cm)

ii.   Determine the pulling force that the ox can provide if it is estimated to be 1/3 of its weight

[3 marks]

QUESTION 3

a) Distinguish between renewable and non-renewable sources of energy. [6 marks]

b) Give three examples of each source of energy. [6 marks]

c) "Renewable energy is the most widely used energy by Swazis".
    i)   Do you agree with the above statement? [2 marks]
    ii) Give reasons/examples for the choice of your answer
                                                        [4 marks]

d) The power obtained from wind by a windmill is given by the equation
$$P = CD^2v^3$$
    Where   C = constant
            D = diameter of the blades
            v = velocity of the wind.
Calculate
    i)   The power provided by the windmill if it is fitted with 2.5 m diameter blades and the wind is blowing at 8 m/s. Assume a constant C=0.5. [6 marks]

    ii) The increase in power generated by the windmill when the wind speed increases from 6 km/h to 8 m/s? [6 marks]

QUESTION 4

a) An oil can is inscribed SAE10W40. What information is being communicated by the letters and figures? [4 marks]

b) List five common causes of engine overheating. [10 marks]

c) List the pros and cons of using belt drives to transmit power in farm machinery. [10 marks]

d) How much energy is used by a light bulb that was left burning overnight for 10 hours? [6 marks]