UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER

PROGRAMME: BSC AGRIC ECON. AGBMGT. II
BSC AGRIC EDUC. II
BSC AGRON. II
BSC ANI. SC. II
BSC ANI. SC. (DAIRY) II
BSC HORT. II

COURSE CODE: ABE 210

TITLE OF PAPER: PRINCIPLES OF FARM MECHANISATION

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)   What are advantages of using farm machines in the southern African
      region?   [12 marks]

b)   Name any three examples of each category in a) above   [6 marks]

c)   Distinguish between motion transmission and motion transformation during
      transfer of power from an energy source to a farm task.   [4 marks]

d)   Figure 1 shows a double-reduction gear transmission system. Gears B and
      C form a compound wheel that rotate with shaft z. The gear ratio between
      gear A and D is 10:1. The numbers of teeth are A 24, C 24 and D 60.
      Determine
      i.   The number of teeth for gear B.   [6 marks]

      ii.   The speed of the output shaft D if input speed is 3000 rpm.   [4 marks]
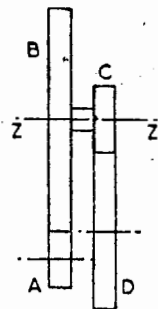

Figure 1   Gear train for a farm equipment

e)   What are the advantages of using gear system in agricultural
      applications?   [8 marks]

QUESTION 3

a)   What key operations must be performed during planting of seeds?

[5 marks]

b)   Classify planting equipment by the method of placing seed in the field.

[6 marks]

c)   State, giving an example, the type of seeds that you would recommend to plant using each equipment given in b) above.   [6 marks]

d)   During calibration of a two row planter, the following measurements were obtained:

parameter	value
Distance between drive wheels	90 cm
Drive wheel diameter	50 cm
Mass of seeds collected from both seed hoppers	1.8 kg
Distance moved	100 m

Determine
i. the mass of seed that the farmer must buy for a 5 hectare farm. [10 marks]

ii. the number of 50 kg bags that should be purchased.   [3 marks]

QUESTION 4

a)   Define tillage.   [3 marks]

b)   Explain why disc ploughs are preferred to mouldboard ploughs in tropical countries.   [10 marks]

c)   A three bottom plough is to be attached to a tractor before setting out to the field. The width of cut per bottom is 45 cm.

   (i)   Determine the total width of cut of the plough.   [5 marks]

   (ii)   Calculate the centre of load from the furrow wall of the previous pass, i.e. from the wing of the first bottom.   [6 marks]

d)   Distinguish between single acting, offset and tandem disc harrows.

[6 marks]

SECTION II ANSWER ANY TWO QUESTIONS

QUESTION 2

a) What characteristics are considered during elimination process of animals for draught power? [6 marks]

b) Discuss any two of the characteristics listed in a) above. [6 marks]

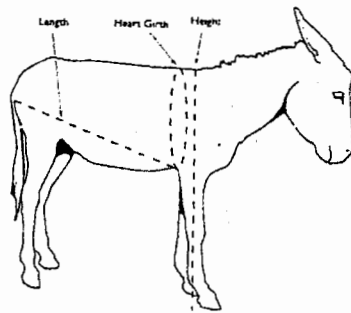c) A donkey shown in Figure 2 has a girth of 1500 mm and a length of 1200 mm.

Figure 2   measurements on a donkey

    i.   Estimate the mass of the donkey using the formula below.

$$\textit{Live mass (kg)} = \frac{G^{2.12} \times L^{0.688}}{3801}$$

G = girth (cm)
L = length (cm)

[6 marks]

    ii.   Determine the force that the donkey can offer if it pulls 3/5 of its weight [3 marks]

d) Name the types of wheeled tractors used in agricultural enterprises. [3 marks]

e) What are the distinguishing features of each wheeled tractor in d). [6 marks]