UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER

PROGRAMME: BSC ABE. II

COURSE CODE: ABE 205

TITLE OF PAPER: 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) Explain the purpose of leaving headland in a ploughing operation using a tractor? [6 marks]

b) Discuss why the use of mouldboard ploughs among small scale farmers in Swaziland is widespread. [14 marks]

c) A farmer has twos week (an 8 hour working day and 5 working days per week) to till a field of 160 hectares in preparation for planting. Tillage is carried out at a depth of 250 mm using a chisel plough that is drawn at 7 kph and a field efficiency of 95% is achieved. The specific soil resistance is estimated to be 22 kN/m after the first rains.

Determine

i) Expected work rate of tillage operations [5 marks]

ii) The appropriate width of the chisel plough [6 marks]

iii) Implement draught force [3 marks]

iv) The necessary drawbar power to pull the plough [3 marks]

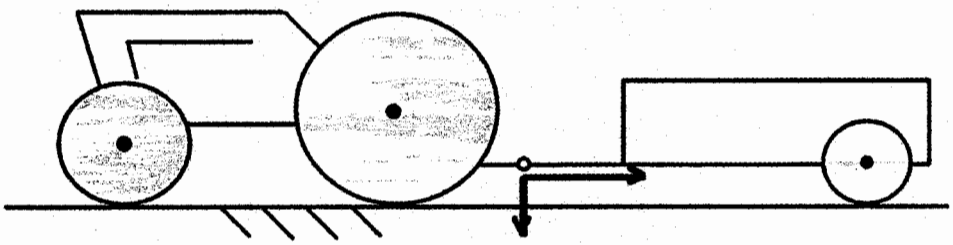
v) The recommended tractor brake power if drawbar power is estimated to be 2/3 of the engine brake power. [3 marks]

SECTION II – ANSWER ANY TWO QUESTIONS

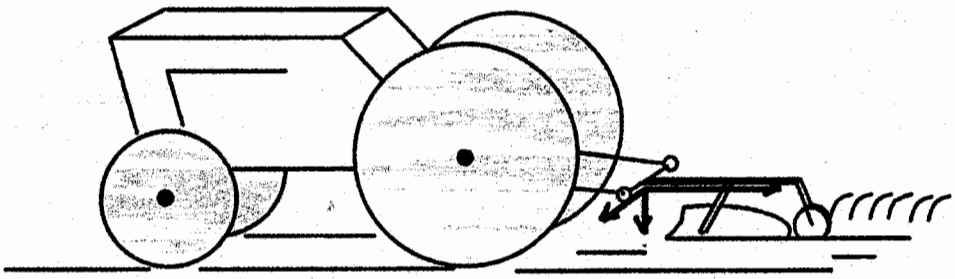
QUESTION 2

a) Figure 1 shows various mounting possibilities of farm equipment to a tractor.
   i) Name the types of mounting/attachment shown in (a), (b) and (c). [6 marks]

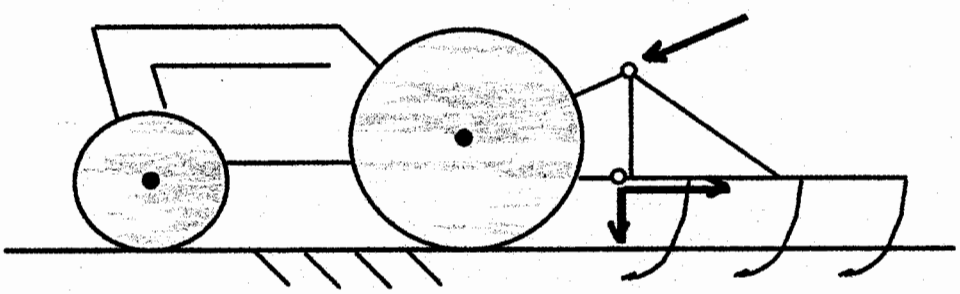
   ii) Distinguish between the different attachments using implement weights transfers and implement control as parameters of distinction. [12 marks]



(a)



(b)



(c)

Figure 1 common types of attaching implements to tractors

b) Table 1 shows common types of nozzles found on the market.
In table form similar to Figure 2,

i) name the type of nozzle [4 marks]
ii) describe the spray quality [4 marks]
iii) the common applications where used. [4 marks]

Table 1. Common types of nozzles used in agricultural applications

	PICTURE	TYPE	USE	QUALITIES
1				
2				
3				
4				

QUESTION 3

a) Briefly discuss the five functions performed by a maize planter during planting operations. [10 Marks]

b) Name the different methods of planting [8 Marks]

c) A two row planter with openers spaced 90 mm apart is equipped with a dry fertiliser applicator. During planter calibration a bag is placed over one outlet and it is drawn at 8 kph. In a distance of 100 m, 4 kg of fertilizer was collected. If a farmer has 30 hectare of land to plant,

calculate

i) the application rate [6 marks]
ii) the number of 50 kg bags a farmer must buy for the 30 hectare farm. [6 marks]

QUESTION 4

a) The process of cutting grass has to be performed such that minimum damage is done to the leaves of the grass. The basic methods through which the cutting force may be applied is either by shearing the grass stalk between a moving knife and a stationary counter-shear, or by impact cutting where the impact force of the blade moving at high speed is used to cut the stem of the grass.

i) Name the equipment used in two methods for cutting the grass. [4 marks]
ii) Which method is preferred these days? [1 mark]
iii) Give reasons why farmers prefer equipment which use the method you named in ii) above. [6 marks]
iv) What are the disadvantages of the preferred equipment? [4 marks]

b) Figure 1 shows the parts of an ox-drawn plough.

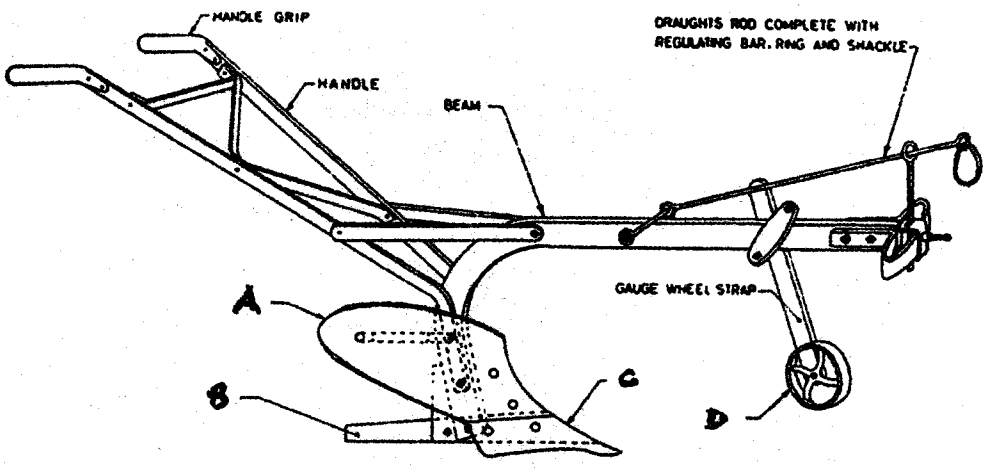


Figure 1 Ox-drawn mouldboard plough

i. Name the parts labelled A, B, C and D [4 marks]

ii. What are the functions of the parts listed in i. above? [4 marks]

iii. Two oxen of masses 400 kg and 500 kg are used to pull the plough. Explain the effect of spanning the oxen such that the resultant line of pull is in the direction of motion of ploughing. [7 marks]