UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER

PROGRAMME: BSC LWM. II

COURSE CODE: LUM 203 (NEW PROGRAMME)

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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GRANTED BY THE CHIEF INVIGILATOR

SECTION I   COMPULSORY

QUESTION 1

a) List five power transmission systems and state advantages and disadvantages of any one of the power transmission systems.

[10 marks]

b) Explain why chains and sprockets are the preferred power transmission units in planters.

[12 marks]

c) Figure 1 (attached) shows a drive mechanism for a loading auger of a maize harvester. The input pulley at A is driven by a tractor PTO rotating at 540 rpm and the power is transmitted by belts through pulleys B, C, D and by a chain drive at sprockets E and F. the power is turned through 90^0 by bevel gears at G and H. The loading auger is driven by gear H.
    If the auger delivers 5 g of maize for every revolution, calculate

    i.   the feed rate of maize into the tank per minute.

[9 marks]

    ii.   The time required to fill a 2 T tank..

[9 marks]

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]

c)   A span of draught oxen generates a pull in the trek chain of 1.21 kN
      when walking steadily at an average speed of 0.9 m/s. Given that the
      angle of pull is 16^0, and the plough width of cut is 200 mm, calculate:
      (i)   Draught force;

      [2 marks]

      (ii)   The power generated by the oxen;

      [2 marks]

      (iii)   The time required in actual ploughing to finish one hectare;

      [2 marks]

      (iv)   The distance travelled to complete one hectare;

      [2 marks]

      (v)   The work done by the oxen in ploughing one hectare.

      [2 marks]

QUESTION 3

a) Where mains/grid power is available, electric motors are a preferred
   source of motive power around the farmstead. Briefly discuss three
   advantages of electric motors over heat/internal combustion engines.

   [12 marks]

b) There is a drive to increase electric grid in rural areas of Swaziland under
   the rural electrification programme. What safety features must farmers
   who will be using electrical appliances observe?

   [6 marks]

c) What is meant by power factor in electrical motor power supply and how
   does it affect the performance of the motor?

   [6 marks]

d) An electric motor is connected to a mains supply of 240 V and receives a
   current of 8 A. the motor has a power factor of 0.8. Calculate the power
   that the motor delivers at the driving shaft of the connected equipment.

   [6 marks]

QUESTION 4

a) Distinguish between cross/diagonal and radial plies when describing tyres.

[5 marks]

b) What are the practical implications of soft soil on wheel slip and rolling resistance of tyres? How can the performance of the tyre be improved?

[10 marks]

c) A tractor wheel is rotating at 30 rpm during farm operations in a condition where 5% slip is observed. Calculate the forward speed of the tractor in kph if the tyre markings are 16.9 – 30 130 A5.

[15 marks]

D_A=230 mm
D_B=230 mm
D_C=315 mm
D_D=210 mm
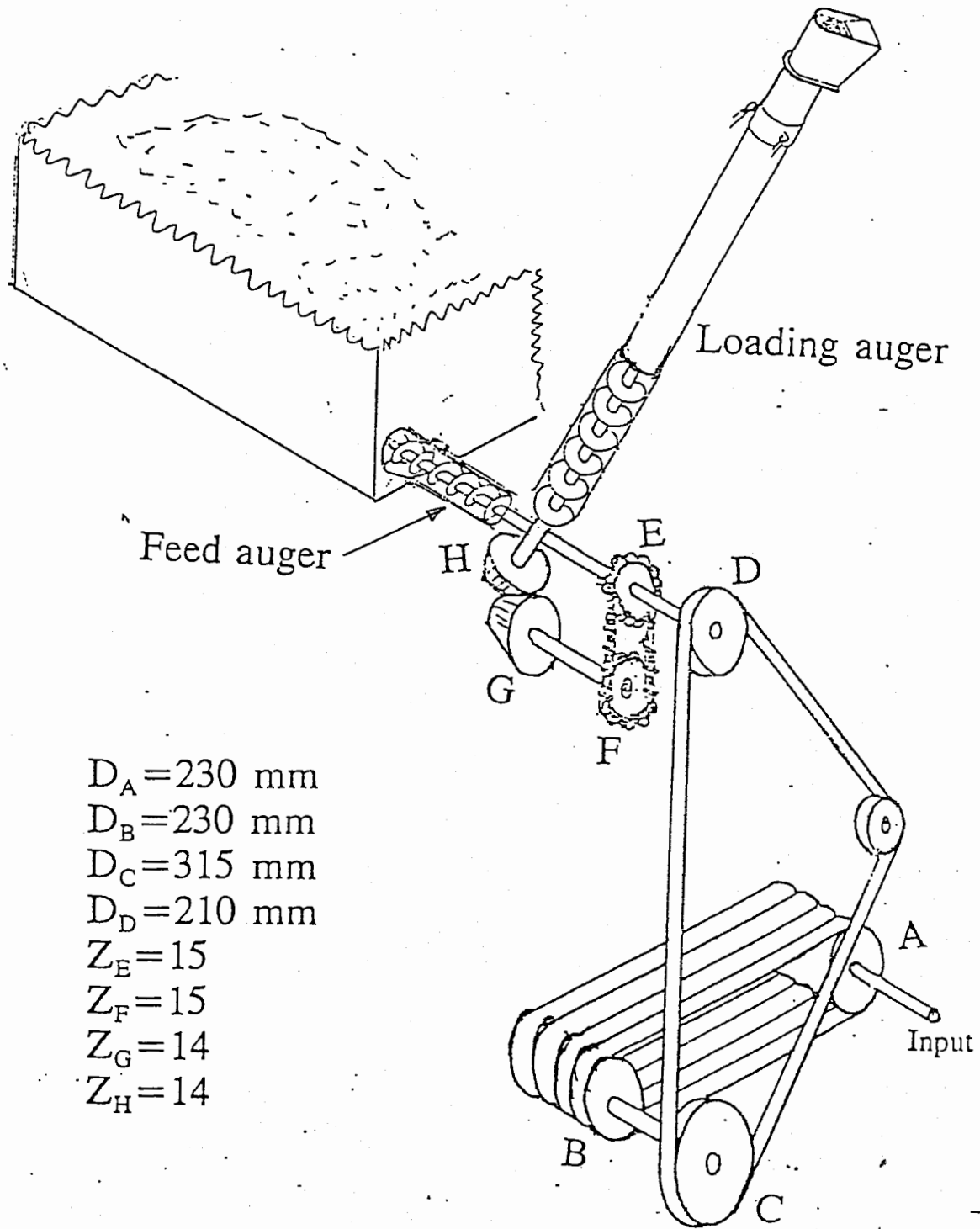Z_E=15
Z_F=15
Z_G=14
Z_H=14

Figure 1   Power transmission for a loading auger of a maize harvester