EMBU UNIVERSITY COLLEGE

(A Constituent College of the University of Nairobi)

INSTRUCTIONS:

Answer Question ONE and ANY other TWO Questions

QUESTION ONE

a) Explain how the invention of the cotton gin revolutionized agriculture (3 marks)

b) How did the introduction of rubber tires in the 1920s affect agricultural productivity? (3 marks)

c) Distinguish between the terms **work** and **energy** and give an example of each on the farm environment (3 marks)

d) What is the average power that can be derived from a human being of mass 65 kg? (3 marks)

e) Explain the major difference between "passive" and "active" solar energy systems. (3 marks)

f) State three advantages of primary tillage. (3 marks)

g) If a tractor mows 2000 kg of hay in one hour and consumes five litres of petrol and if the price is KSH 100 per litre, calculate the rate of harvesting in kg per minute and the cost of mowing in KSH per kg harvested. (3 marks)

h) Explain why it is important to know the 1000 grain mass when using mechanized equipment (3 marks)

i) Differentiate between HAT and VAT wind turbines. (3 marks)

j) Explain how the efficiency of a threshing machine can be determined (3 marks)

QUESTION TWO

a) Sketch a HAT wind mill and label five major parts (8 marks)

b) With the aid of diagram discuss the effect of changing the air velocity on the power output of a wind turbine. (8 marks)

c) Explain how one can practically vary the power output of a specific turbine without moving from the geographical coordinates, location. (4 marks)

QUESTION THREE

A plough is likely to experience a soil resistance of 1.6 kN and while being drawn at a speed of 1.2 m/s. The plough is known to be 20 cm wide and to cut to a depth of 20 cm.

a) Sketch a mould-board plough and indicate by name three main parts.   (8 marks)

b) Calculate the drawbar power used in order to plough this filed.   (4 marks)

c) Calculate the soil resistance in N/cm^2.   (4 marks)

d) Explain why the actual power required to plough the field is usually much higher than the theoretical power indicated above.   (4 marks)

QUESTION FOUR

a) Explain the difference between "exploited hydropower energy" and "potential hydropower energy" of a given region.   (5 marks)

b) List and discuss the function of at least three components of hydropower plant.   (9 marks)

c) Discuss the importance of the factors below with respect to the planning of hydropower plants.

                                                                                           (6 marks)

   i)   Topography

   ii)   Economic evaluation and source of funding

   iii) Environmental impact assessment

QUESTION FIVE

a) Six kilograms of grain is obtained after threshing grain using thresher A. The amount of grain recovered from the straw is 600 grams. When using thresher B 9.5 kg of grain is obtained while the straw yields 980 grams. Carefully calculate the threshing efficiency of each machine and select the best based on efficiency.   (10 marks)

b) Discuss four other important factors when selecting a machine.   (10 marks)

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