"Investing in Africa's Future"

COLLEGE OF HEALTH, AGRICULTURE & NATURAL SCIENCES

AAE 101 INTRODUCTION TO AGRICULTURAL ENGINEERING

END OF FIRST SEMESTER EXAMINATIONS

NOVEMBER/DECEMBER 2017

LECTURER: ZENDERA. W.

DURATION: 3 HOURS

INSTRUCTIONS

1. Do not write your name on the answer sheet
2. Use Answer Sheets Provided
3. Begin your answer for Each Question on a New Page
4. Credit is Given for Neat Presentation

AAE 101: Introduction to Agricultural Engineering

Instruction: Answer any Five questions.

Question 1

a) Explain how engineering principles are applied in crop production. [10]
b) Name and briefly describe the main branches of agricultural engineering. [10]

Question 2

a) Define the following terms:- [10]
   i. Datum,
   ii. Reduced level,
   iii. Benchmark,
   iv. Back-sight, and
   v. Fore-sight.

b) The readings from table 1 below, where obtained from a staff on a series of pegs at 20 m intervals along the proposed route of a boundary fence.

Table 1: Staff readings

BS	IS	FS	Rise	Fall	Remarks
0.66					A BM (100)
	1.94				B
	1.08				C
	1.15				D
2.78		1.58			E
	2.27				F
	1.21				G
		0.64			H

Calculate the reduced levels at A, B, C, D, E, F, G, and H, do the arithmetic check. [10]

Question 3

a) Explain how you would consider the following factors in farmstead planning: [12]
   i. Topography,
   ii. Services,
   iii. Climate, and
   iv. Fire prevention and safety.
b) Describe the characteristics of wood that make them suitable as construction material in farm buildings. [8]

Question 4

a) Describe the properties of concrete that makes it suitable as construction material for agricultural buildings. [8]
b) With the aid of a diagram, explain how the water compressive strength of concrete varies with the water/cement ration. [4]
c) You are planning to purchase material for the construction of a concrete floor for a 10 m x 20m concrete floor with a thickness of 70 mm for a broiler housing facility suitable for 2000 broilers. The concrete mix ratio is 1:3:6. From experience the volume of the concrete mixture decreases by 25% after setting and assuming that 5% of the volume will be lost as waste. Given that a 50 kg of cement is equivalent to 37 litres, density of sand is 1.45tonnes/m^3 and density of stone is 1.6 tonnes/m^3
   Calculate:
   i. The number of bags of cement required, [3]
   ii. The quantity of sand required, and [3]
   iii. The mass of stones required. [2]

Question 5

a) Discuss the factors affecting the velocity of flow in open channels. [6]
b) Discuss the factors affecting frictional loss in pipe flow. [4]
c) What is water hammer? Give examples that may cause water hammer and how it can be prevented? [10]

Question 6

a) Distinguish between natural grain drying and artificial grain drying. [4]
b) Discuss the advantage and disadvantages of artificial grain drying. [10]
c) The ambient air at 25°C and 70 % relative humidity is heated to 45 °C and 24 percent relative humidity while the temperature drops to 30.1 °C the air flow rate is 30 m^3 per hour. Calculate the amount of moisture removed per kilogram of air. [6]