



MACHAKOS UNIVERSITY

University Examinations for 2022/2023

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

THIRD YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (AGRICULTURAL EDUCATION AND EXTENSION)

AGN 373: FARM STRUCTURES

DATE:

TIME:

INSTRUCTIONS

This paper contains **FIVE** questions

Question **ONE** is **COMPULSARY** and carries **30 Marks**

Questions **TWO – FIVE** carries 20 Marks each. **Answer question ONE and any other TWO questions**

QUESTION ONE -COMPULSARY (30 MARKS)

- a) Briefly discuss the importance of farm structures in agricultural production. (6 marks)
- b) The transformation of agriculture and other rural enterprises and livelihoods will require *innovation, planning, design, construction, operation and maintenance* phase. Briefly discuss what each phase involves. (6 marks)
- c) Explain what you understand by the following. (5 marks)
 - i) Regional planning
 - ii) CADD
 - iii) Stiffness of wood
 - iv) Aggregate of concrete
 - v) Greenhouse
- d) Sketch a plan of a dwelling house and clearly show the basic space (room) allocations. (6 marks)
- e) A farmer in Kiambu requires to construct a rectangular concrete floor for his zero-grazing unit measuring 8.0 m by 5.0 m and 75 mm thick. If he is to use a nominal mix of 1:2:4, 30% decrease in volume and 5% wastage, calculate the volume of materials required. Take the bulk density of sand and ballast to be 450 kg/m³ and 1600 kg/m³ respectively. (7 marks)

QUESTION TWO (20 MARKS)

- a) What are the specific characteristics considered during the manufacturing of building boards? (2 Marks)
- b) Name the manufactured building boards 1, 2, 3, 4, 5 and 6 shown in **Figure Q2(a)**. (3 marks)

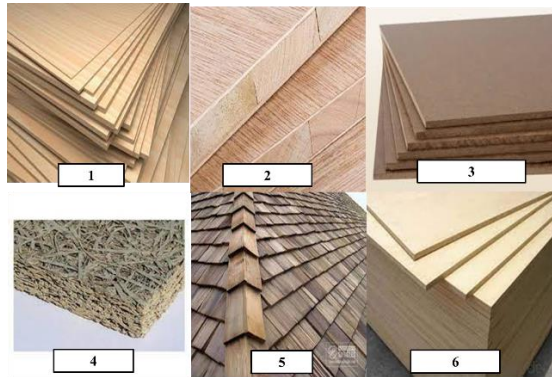


Figure Q2(a): Manufactured building boards

- c) Briefly explain what you understand by the following. (8 marks)
- Rammed earth
 - Stabilized-soil blocks
 - Form work
 - Salt concrete finish
- d) Briefly explain using sketches how slump test is carried out. (7 marks)

QUESTION THREE (20 MARKS)

- a) Sketch the following three types of foundations and briefly explain the circumstances under which they are used. (6 marks)
- Curtain wall
 - Pole
 - Floating slab
- b) Why is concrete reinforced and which are some the the four common materials used for its reinforcement? (4 marks)
- c) Differentiate between hydraulic and non-hydraulic binders. (4 marks)
- d) Outline the three categories that components that require off-site prefabrication fall into (6 marks)

QUESTION FOUR (20 MARKS)

- a) Sketch a building production process model clearly indicating the inputs and outputs. **(6 Marks)**
- b) Briefly explain what you understand by the following. **(6 Marks)**
 - i) Tendering
 - ii) General guidance costing
 - iii) Right-off life
- c) List any ten general contents of a standard contract. **(5 Marks)**
- d) What is a zero grazing unit? **(3 Marks)**

QUESTION FIVE (20 Marks)

- a) Sketch a plan view of the following types of milking parlours and briefly explain their main design features. **(6 Marks)**
 - i) Tandem parlour
 - ii) Walk-through parlour
- b) Why is careful animal waste management necessary? **(3 marks)**
- c) Determine suitable width (W), length (l_1) and (l_2) for a slurry manure pit with an access ramp **(Figure Q5(c))**, given the following: Number of animals (N) = 10 dairy cows (Wt) = 600 kg; Volume of manure per cow (v) = 0.065 m³/day; Storage period (D) = 25 days, Ramp slope(s): 15%; Length- (l) = 5 m; Depth (h) = 0.5 m. **(6 marks)**

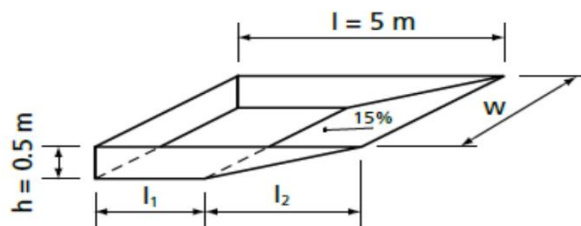


Figure Q5(c): a zero-grazing system for a smallholder

- d) **Figure Q5(d)** shows a flowchart of pigs' life cycle. Name the stages numbered 1 to 10. **(5 marks)**

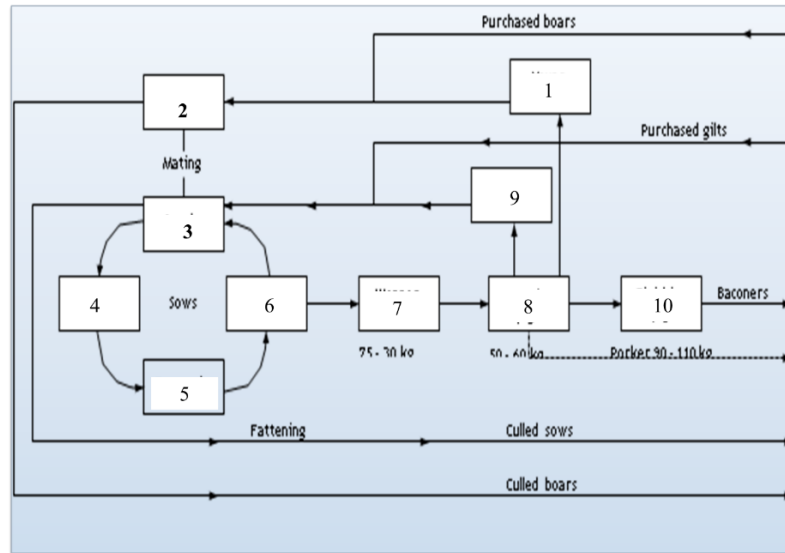


Figure Q5(d): Flowchart of the life cycle of pigs