



KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN RENEWABLE
ENERGY AND BIO FUELS TECHNOLOGY

COURSE CODE: REN 214

COURSE TITLE: Introduction to Engineering Design

DURATION: 2 HOURS

DATE: 20/12/2022

TIME: 2:00-4:00PM

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other **TWO** (2) Question.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of **4** printed pages. Please Turn Over



KIBU observes **ZERO** tolerance to examination cheating

Question One

- (a) State three terms that have the same meaning as “engineering design” [3 Marks]
- (b) An engineer has designed and built a prototype to improve the brake system of a car. What are the next steps that the engineer should take in the process? [1 Mark]
- Test and evaluate*
- (c) In science, you first form a hypothesis; in engineering design, what do you do first? *Define a problem* [2 Marks]
- (d) Sketch and explain the five (5) simple machines [5 Marks]
- (e) List any 10 common forms in which metals are supplied [5 Marks]
- (f) Steel, aluminium and copper are common metals used in many engineering designs. Explain the special qualities of each that make it useful in designs that you are familiar with. [6 Marks]
- (g) List any 10 electrical/electronic and explain their purpose in electric circuits [5 Marks]
- (h) Briefly explain how electric motors do the same job differently [3 Marks]

Question Two

Computers and digital electronics have simplified and shorted the time it takes to move from an idea to a finished product. Explain this with reference to computer aided design (CAD) and computer aided manufacturing (CAM) [20 Marks]

Question Three

- (a) Explain the process that you would use to gather information on a new design with which you have had no experience before. [3 Marks]
- (b) Describe the purposes of the design log book. Include in your description the method by which the designer ensures each purpose is met. [3 Marks]
- (c) Explain why it is important for engineers to be capable of working from first principles when we also have national standards for designers to work from. [2 Marks]
- (d) "Plagiarism is unacceptable". Define plagiarism and explain what you understand this statement to mean in the context of engineering design. [2 Marks]
- (e) Explain the difference between a **model**, **prototype**, and a **proof of concept** giving examples of each. [6 Marks]
- (f) Give **three (3)** reasons why you would produce a model during the design process. [2 Marks]
- (g) Bio-mimicry is an important technique used during the design concept phase. In your own words, describe what is meant by this term and give examples of the use of this technique. [2 Marks]

Question Four

- (a) Explain what is meant by "machine design" [3 Marks]
- (b) (i) Material selection is an important step in designing products. State any FIVE properties of materials that influence choice [5 Marks]
- (ii) Define the properties mentioned above [10 Marks]
- (c) Explain the term kinematics as applied to machines [2 Marks]

Question Five

- (a) In your role as a Design Engineer, you are asked to undertake the concept design of a new type of food mixer/processor
- (b) Produce ten (10) questions that you would ask the client to help you better understand both their requirements and expectations [5 Marks]
- (c) What are the goals of the design engineer while negotiating the specifications for a new design for a client? [2 Marks]
- (d) What's the purpose of the design brief in the context of undertaking a new design task? [2 Marks]
- (e) Generate and sketch five (5) different conceptual designs for the food mixer/processor based on how you would personally have answered the questions given in part (a). Include descriptions of special features within each concept [5 Marks]
- (f) Assess the five (5) concepts given in part (d) using a concept evaluation matrix to determine the "Best in class" using the following objective: [6 Marks]
 - Ease of cutting/slicing
 - Ability to control mixing
 - Simplicity of operation
 - Ability to mix/slice difficult foods
 - Range of food groups to be mixed or processed