KIBABII UNIVERSITY

2021/2022ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER

MAIN EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN RENEWABLE ENERGY AND BIOFUELS TECHNOLOGY

COURSE CODE: REN 426

COURSE TITLE: HYDROGEN AND FUEL CELL TECHNOLOGY

DATE: 06/09/2022 **TIME: 2:00PM-4:00PM**

INSTRUCTIONS TO CANDIDATES

Answer question **ONE** and any other **TWO** questions

This paper consists of 4 printed pages. Please Turn over

SECTION ONE: ATTEMPT ALL QUESTIONS IN THIS SECTION: 30 MARKS

QUESTION ONE

a. Define the following terms as used in Hydrogen and fuel cells technology (5mks)
   i. Anode
   ii. Cathode
   iii. The catalyst
   iv. Electrolyte
   v. Reformer.

b. State the main challenge in storage of hydrogen through compression and liquefaction. 2mks

c. Briefly explain how hydrogen technology will solve the challenges in:
   i. Fossil fuels. 3mks
   ii. Solar energy 2mks

d. Compare and contrast fuel cells and batteries as energy storage devices. 6mks

e. List any three main categories in fuel cells applications. 3mks

f. Explain ANY TWO environmental concerns in the use of Hydrogen as a source of energy 4mks

g. Using a well labelled diagram, explain the working mechanism of a simple fuel cell 7mks

SECTION TWO: ATTEMPT ANY TWO QUESTIONS; 40 MARKS

QUESTION TWO

a. Describe how hydrogen is produced under the following methods:
   i. Steam reforming 4mks
   ii. Water hydrolysis 6mks
   iii. Biological hydrogen creation 2mks

b. Discuss any TWO methods employed in storage of Hydrogen gas. 8mks

QUESTION THREE

a) List ANY five types of fuel cells 5mks

b) Using a well labelled diagram, describe the working principle of alkali fuel cells 10mks

c) .State any FIVE advantages of hydrogen economy 5mks

QUESTION FOUR

a. List ANY FOUR limitations in use of hydrogen as source of energy. 4mks

b. Briefly describe role of renewable energy resources in development of hydrogen economy. 6mks

c. Using a well labelled diagram, explain the working principles of molten carbon fuel cells. 10mks