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KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2019/2020ACADEMIC YEAR

FOURTH YEAR SECONDSEMESTER
MAIN EXAMINATIONS

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

COURSE CODE: IET 423

COURSE TITLE: SUSTAINABLE ARCHITECTURE

DURATION: 2 HOURS

DATE: 13TH NOVEMBER, 2020 **TIME: 2:00PM-5:00PM**

INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- 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 **2** printed pages. Please Turn Over

QUESTION 1 (30 marks)

a. Define the following terms:
   i. Sustainable Architecture. (1 mark)
   ii. Azimuth angle. (1 mark)
   iii. Solar altitude angle. (1 mark)
   iv. Zenith angle. (1 mark)

b. State any five (5) Renewable energy Technologies. (5 marks)

c. State any five (5) ways of ensuring home energy efficiency. (5 marks)

d. State any five (5) major components in a solar hot water heating system. (5 marks)

e. Calculate the power in a wind moving with speed u = 6 ms^{-1}incident on a wind turbine with blades of 80 m diameter. How does the power change if the wind speed increases to u = 12ms^{-1}. Assume the density of air is 1.2 kgm^{-3}. (5 marks)

f. Direct sunlight of average intensity 300Wm^{-2} is incident normal on a solar cell. The area of the cell is 0.2 m^2. What is the total incident energy in one day in kWh? How is this total energy altered if the sunlight falls at an angle of 20^0 to the normal to the surface of the cell? (6 marks)

QUESTION 2 (20 marks)

a. Explain what is contained in a microCHP system and how it works. (4 marks)

b. State any three (3) factors that cause the change in sun paths. (3 marks)

c. State the seven (7) steps that are followed when reading the Sun position from a stereographic sun-path diagram. (7 marks)

d. State any six (6) passive solar design principles. (6 marks)

QUESTION 3 (20 marks)

a. State any three (3) factors that determine thermal mass. (3 marks)

b. Describe any five (5) categories of heat exchangers in industrial heat recovery systems. (10 marks)

c. State any Seven (7) broad categories of energy efficiency measures as recommended by energy audits. (7 marks)

QUESTION 4 (20 marks)

a. List any five (5) BREEAM & Eco homes design aspects and their aim. (10 marks)

b. Describe any (5) Key BedZED principles. (10 marks)

QUESTION 5 (20 marks)

a. Describe how Rammed earth and cob structures are constructed. (10 marks)

b. Describe any five (5) sustainable building techniques. (10 marks)