# KIBABII UNIVERSITY

**2020/2021 ACADEMIC YEAR**

**THIRD YEAR SECOND SEMESTER**

**MAIN EXAMINATIONS**

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

**COURSE CODE:** IET 314

**COURSE TITLE:** ENERGY MANAGEMENT

**DATE: 12/07/2021** **TIME: 2:00-4:00PM**

**INSTRUCTIONS TO CANDIDATES**

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

This paper consists of 5 printed pages. Please Turn over

## QUESTION ONE

a. Differentiate the following concepts as used in energy (3mks)
   i. Energy management.
   ii. Energy conservation
   iii. Energy efficiency
b. State any THREE benefits of energy management in an organization (3mks)
c. Give TWO advantages of using statistical survey as a source energy management data (2mks)
d. Briefly explain the following steps in energy management (4mks)
   i. Optimize the energy supply.
   ii. Maximize the system efficiency
e. Explain the following terms as used in energy management steps?
   I. Internal comparison (2mks)
   II. External comparison (2mks)
f. Which are the two main ways in which energy managers obtain data during energy management? (2mks)
g. Energy efficiency is an energy management technique. Give FOUR ways in which energy efficiency can be achieved in an office setting. (4mks)
**h.** Define the following terms as the following terms as used in energy management
   i. Maximum demand (2mks)
   ii. Kilowatt hours used (2mks)
   iii. Demand profile (2mks)
i. Why is energy conservation strategy important for learning institutions like Kibabii University (2mks)

## QUESTION TWO

a. The table below shows the average hourly energy consumption data for a typical day recorded at one of the lecture rooms at Kibabii University. Use it to answer the questions that follows:

| Hour | Kw | Hour | kW | Hour | kW |
|---|---|---|---|---|---|
| 1.00 am | 45 | 9.00am | 120 | 5.00pm | 110 |
| 2.00am | 47 | 10.00am | 122 | 6.00pm | 82 |
| 3.00am | 43 | 11.00am | 121 | 7.00pm | 60 |
| 4.00am | 46 | 12.00pm | 100 | 8.00pm | 61 |
| 5.00am | 45 | 1.00pm | 124 | 9.00pm | 63 |
| 6.00am | 62 | 2.00pm | 135 | 10.00pm | 61 |
| 7.00am | 69 | 3.00pm | 120 | 11.00pm | 65 |
| 8.00am | 95 | 4.00pm | 123 | 12.00pm | 50 |

I. Draw the demand profile using the data in the table above (5mks).
II. Describe the nature of the nature of the demand profile drawn in (i) above (3mks)
III. Identify the peak and off peak demand from the demand profile drawn (2mks)
IV. List any THREE low cost measures that can be employed to reduce the peak power demand (3mks)

b. State the main objective of demand profile in energy management procedures (2mks)
c. Explain how the concept of consumer awareness can help in energy management in any organization (5mks.)

## QUESTION THREE

a. State any THREE examples that can be practiced during energy conservation. (3mks)

**b.** Explain any THREE data collection methods employed during energy management. (6mks)

**c.** The table shows the total energy consumption by Kibabii High School in the year 2018. Find the total energy consumed that year in kWh and the total amount spent in purchasing these energy types (11mks)

| Energy type | Purchased Units | Purchased Units in kWh | Cost per kWh | Total Cost |
|---|---|---|---|---|
| Electricity | 61500kWh | 61500kWh | 5.00 | |
| Propane | 2000$m^3$ | | 1.5 | |
| Oil | 20000 l | | 9.00 | |
| Totals | | | | |

**Use the information below:**

| FROM | CONVERSION FACTOR | TO |
|---|---|---|
| MJ | 0.2778 | kWh |
| GJ | 277.8 | kWh |

The calorific value for propane and oil are 92.6GJ/$M^3$ and 38MJ/L respectively.

## QUESTION FOUR

a. During energy monitoring, Bungoma referral hospital produced data as shown in the table below:

| Degree days experienced per month (x) | 72 | 88 | 95 | 106 | 169 | 204 | 244 | 265 | 290 | 298 | 332 | 345 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gas Consumption per month (y) (GJ) | 482 | 520 | 634 | 570 | 671 | 860 | 903 | 940 | 1007 | 1210 | 1020 | 1131 |

i. Find the base fit curve equation for the data given in the table above (12mks).

ii. Use the data in the table above to draw a regression analysis curve. (6mks)

**b.** Why is energy data analysis important in energy management (2mks).

## QUESTION FIVE

a. State the energy efficiency indicators in the following sectors:
   I. Transport sector. (2mks)
   II. Manufacturing sector. (2mks)
   III. Residential sector. (2mks)
   IV. Service sector (2mks)

b. Explain how weather patterns affect energy demand and supply if other factors are held constant (3mks).

c. Give FIVE causes of energy wastage in an industry (5mks)

d. Explain why and how change in consumer income can influence his/her energy demand. (4mks)