



KIBABII UNIVERSITY

2021/2021 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER

SPECIAL EXAMINATIONS

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

COURSE CODE: IET 425

COURSE TITLE: ENERGY AUDITING

DATE: 20/1/2022

TIME:11-1PM

INSTRUCTIONS TO CANDIDATES

Answer question ONE and any other TWO questions

This paper consists of 5 printed pages. Please Turn over

QUESTION ONE

- a. Define the following terms:
 - I. Energy auditing (2mks)
 - II. Energy management (2mks)
 - III. Energy efficiency. (2mks)
 - IV. Load profile (2mks)
- b. Energy Auditing has gained popularity both in industries and organizations. Briefly state the significance of energy audit in industries (4mks)
- c. List any THREE types of energy audit (3mks)
- d. Why is it important to calculate demand profiles in energy management practices? Give two reasons.(2mks)
- e. Using autonomy method, draw a load profile for the loads identified in the table below: (4mks)

Description	Load (VA)	Autonomy (h)
DCS Cabinet	200	4
ESD Cabinet	200	4
Telecommunications Cabinet	150	6
Computer Console	90	2

- f. Explain the following terms as used in energy management steps?
 - I. Internal comparison (2mks)
 - II. External comparison (2mks)
- g. 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 (5mks)

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

QUESTION FOUR

- 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 FOUR

- a. During energy auditing at Bungoma referral hospital, the energy auditor recommended implementation of low cost or no cost measures as a way of managing energy expenditure in the hospital. Briefly discuss some of the low/no cost measures that can be employed (10mks)
- b. Energy auditing aims at minimizing energy wastages. Briefly explain some of the causes of energy wastage. (10mks)

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/M³ and 38MJ/L respectively.

QUESTION TWO

- a. Explain how energy audit can be done at the following levels:
 - i. Home Energy Audit (5mks)
 - ii. Industrial Energy Audit (5mks)
- b. Describe how audit can be carried out using the following techniques
 - i. Pollution audits (5mks)
 - ii. Infrared thermography audit (5mks)

QUESTION THREE

- a. Define the term energy index as used in Energy Audit (1mk)
- b. Consider a company using three energy forms oil, gas and electricity. The annual energy consumption is shown below in watt hours. If the company produces 100×10^3 tons of a particular product.

Energy Type	Energy in Wh
Oil	0.520×10^9
Gas	0.146×10^9
Electricity	1.661×10^9

Calculate:

- 1) Percentage energy balance (3mks)
 - 2) Energy indices (5mks)
- c. Discuss THREE types of energy audits used in energy management (6mks)
 - d. Give two main sources of data used in energy management (2mks)
 - e. Which are the THREE main ways in which energy managers obtain data during energy management? (3mks)

QUESTION FIVE

- a. As an energy manager at Kibabii university. You intend to carry out an energy auditing exercise in the vice chancellor's office. Step by step describe how you will carry out this exercise of energy auditing. (20mks)