



# MURANG'A UNIVERSITY OF TECHNOLOGY

## SCHOOL OF ENGINEERING AND TECHNOLOGY

### DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

UNIVERSITY POSTGRADUATE EXAMINATION

2018/2019 ACADEMIC YEAR

**FIRST YEAR FIRST SEMESTER EXAMINATION FOR MASTER OF  
TECHNOLOGY IN ELECTRICAL AND ELECTRONICS ENGINEERING**

**EET 622 – ENERGY AUDITING & DEMAND SIDE MANAGEMENT**

**DURATION: 3 HOURS**

**DATE: 10-5-2019**

**TIME: 9.00 A.M.-12.00 P.M.**

#### **Instructions to candidates:**

1. Answer **Any Four** questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

### QUESTION ONE (25 MARKS)

- a. Briefly explain the following classification of Energy;
- Primary and Secondary Energy
  - Commercial and Non-commercial Energy
  - Renewable and Non-Renewable Energy (6Marks)
- b. Define the cycle of a thermal station plant. The thermal power station has the following losses;
- |                          |       |
|--------------------------|-------|
| Boiler losses            | 11%   |
| Cycle losses             | 44.7% |
| Turbine-generator losses | 6.1%  |
| Plant Auxiliaries        | 2%    |
- Given the input is 100% fuel, use an appropriate diagram to describe the process. (9Marks)
- c. (i) Describe factors which impact on the Return of investment of Renewable Energy System. (5Marks)
- (ii) Briefly explain the advantages of solar thermal over solar PV when considering the payback period of both systems. (5Marks)

### QUESTION TWO (25 MARKS)

- a. Explain using appropriate examples the difference between Energy efficiency and Energy conservation. (6Marks)
- b. During a preliminary Energy Audit, a welding factory was found to have energy Distribution in different departments as follows;
- |                   |     |
|-------------------|-----|
| Welding set       | 64% |
| Hand grinder      | 1%  |
| Air conditioning  | 2%  |
| Air compressors   | 4%  |
| Drill machines    | 2%  |
| Cutlers           | 2%  |
| Power press       | 11% |
| Shearing machines | 9%  |
| Lighting load     | 5%  |

Describe using an appropriate diagram the Energy usage in the factory. What measures can be used to ensure Energy conservation in the factory? (9Marks)

- c. Explain the main objectives of any successful Energy Management in any organization (10Marks)

**QUESTION THREE (25 MARKS)**

- a. Briefly explain why walk through Energy Audit is considered a no-cost Energy Management measure in a given facility? (5Marks)
- b. An Electronic controller is purchased at Ksh. 25,000 for the purpose of managing the lighting system in a modern Macadamia factory in Murang'a County. Assuming the controller can last 8 years before it is replaced at ksh. 0 salvage value. Using the following methods;
- i. Straight line Depreciation
  - ii. Double Declining balance Depreciation

Describe how the tools (i and ii) can be used to analyze the Depreciation of the controller. (20Marks)

**QUESTION FOUR (25 MARKS)**

- a. Define Energy Audit and briefly explain why it is such an important exercise in any organization Energy Management. (5Marks)
- b. An effective Energy Management program must be initiated with management commitment of the organization. Given an organization management chart of Murang'a University of Technology in Fig 1, describe how an effective energy management program can be managed or implemented. (20Marks)

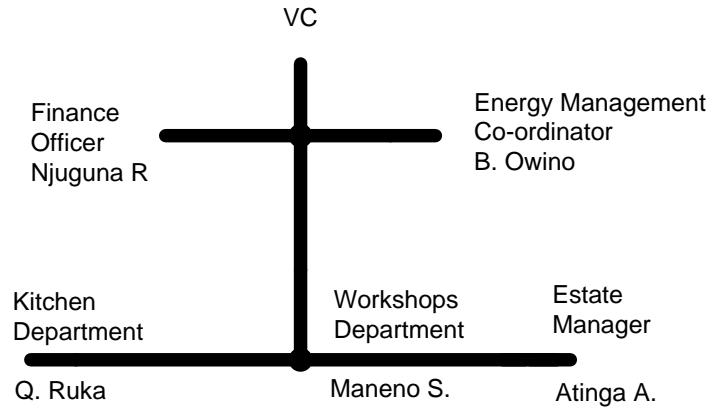


Fig.1 Organization chart of Muranga University of Technology

**QUESTION FIVE (25 MARKS)**

- a. Define the following terms as related to Energy Management;
  - i. Energy Index
  - ii. Energy Efficient motor
  - iii. Energy Instruments
  - iv. Payback in Renewable Energy (10Marks)
- b. Name the key competences of an energy manager in an industrial set up. (6Marks)
- c. Murang'a University of Technology Management has made a decision to replace all the incandescent lamps (bulbs) in the institution with compact fluorescent lights (CFL) after a preliminary energy Audit indicated the university can have substantial Energy saving while improving the general illumination. The following are the characteristics of the two types of lamps.

Lamp Characteristics	Incandescent Lamp	CFL Lamp
Rating	60 Watts	15 Watts
Lumen output	865 lumens	900 lumens
Cost of lamp	Ksh. 60	Ksh. 500
Life of Bulb	1,000hrs	10,000 hrs
Price of Electricity per KWh	Ksh 8.50	Ksh 8.50

Using life cycle costs analysis of a lighting system, evaluate the total savings of implementing the project when the university has 2000 incandescent lamps to be replaced. (9Marks)