



**TECHNICAL UNIVERSITY OF MOMBASA**  
***Faculty of Engineering & Technology***

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATIONS FOR DEGREE IN  
BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING  
(YV, SII)

**EMG 2521: ENERGY MANAGEMENT**

END OF SEMESTER EXAMINATIONS

**SERIES: APRIL 2015**

**TIME: 2 HOURS**

**INSTRUCTIONS:**

- This paper consists of FIVE questions.
- Question ONE (Compulsory) answer any other TWO questions.

***This paper consists of Three printed pages***

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**QUESTION 1 (Compulsory)**

- a) Explain **FOUR** fundamentals in energy management that provide foundations for longer term success. **(4 marks)**
  
- b) i) Differentiate between demand and energy consumption components in an electric bill. **(4 marks)**  
ii) Define power factor. **(2 marks)**  
iii) Explain the **TWO** components of total power delivered by utility company. **(4 marks)**
  
- c) An energy audit for a facility indicates the following measurements at the load side of the transformer; 480V, 1200A and 800kw operating load, determine:  
i) The power factor  
ii) Reactive power (KVAR) in the system **(6 marks)**

- d) i) ISO 5001 is based on the Plan-Do-Check-Act process for continual improvement framework.  
Explain what is involved in Plan-Do-Check-Act Cycle in energy management. **(4 marks)**  
ii) Explain how an energy audit would be carried out for the highlighting system for an organization. **(6 marks)**

## QUESTION 2

- a) Define the following:  
i) Energy efficiency  
ii) Energy conservation **(2 marks)**
- b) i) Explain **FOUR** benefits of good energy management. **(4 marks)**  
ii) State any **FIVE** indicators of poor practice in energy management in an organization. **(5 marks)**
- c) Explain how an organization assesses performance in relation to energy management. **(5 marks)**
- d) Explain any **TWO** benefits of a company or organization being ISO 50001 compliant. **(4 marks)**

## QUESTION 3

- a) i) Explain an energy audit. **(3 marks)**  
ii) Explain the basic component of an energy audit. **(5 marks)**
- b) Explain the use of the following tools in energy audit:  
i) Ultra-red thermometer  
ii) Combustion analyser **(2 marks)**
- c) Explain who should be interviewed prior to carrying out a detailed energy audit in an industrial plant. **(4 marks)**
- d) Explain the processes involved in a residential energy audit. **(6 marks)**

## QUESTION 4

- a) 100KW motor is operating at a power factor of 0.80.  
i) Calculate the total or apparent power required by the motor. **(1 ½ marks)**  
ii) If the power factor is improved to 0.95, determine total power drawn from the supply. **(1 ½ marks)**
- b) i) Illustrate with a flow diagram electricity tariff design. **(4 marks)**  
ii) Classify electricity tariffs and other levies to customers in Kenya. **(6 marks)**
- c) i) Define load shedding electrical supply by utility company. **(1 mark)**  
ii) Explain the reason of load shedding by utility company. **(2 marks)**  
iii) Explain why utilities bill for demand. **(4 marks)**

## QUESTION 5

For the following systems give recommendations on the design and operational requirements for efficient energy use.

a) Lighting **(10 marks)**

b) Boilers **(10 marks)**