



**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)**