



# TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

**UNIVERSITY EXAMINATION FOR:**

BACHELOR OF SCIENCE IN MECHANICAL & AUTOMOTIVE

ENGINEERING

EMG 2519 : MAINTENANCE ENGINEERING & INDUSTRIAL SAFETY

(PAPER 2)

END OF SEMESTER EXAMINATION

**SERIES:** DECEMBER 2016

**TIME:** 2 HOURS

**DATE:** Pick Date Dec 2016

## Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt any **THREE** questions.

**Do not write on the question paper.**

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## Question ONE

- (a) Define maintenance. (2 marks)
- (b) Discuss 4 critical success factors that can be positively influenced by effective asset maintenance. (6 marks)
- (c) Briefly discuss the 3 main forms of maintenance. (6 marks)
- (d) Explain the following terms as used in maintenance engineering: (6 marks)
- Quality,
  - Maintenance concept,
  - Inspection.

## Question TWO

- (a) Define ageing in relation to assets. (2 marks)

- (b) Differentiate deterioration from failure with regard to ageing of assets. (4 marks)
- (c) Briefly discuss 4 factors related to equipment that are affected by deterioration. (8 marks)
- (c) Explain the following mechanisms of corrosion: (6 marks)
- i. General corrosion.
  - ii. Localized corrosion.
  - iii. Velocity related corrosion attack.

### Question THREE

- (a) Differentiate failure density from hazard rate. (4 marks)
- (b) In relation to MTBF (Mean Time between Failures) and M (Maintenance Mean down Time), list 4 ways to improve asset availability. (4 marks)
- (c) With regard to reliability analysis, discuss the three main stages of an equipment bathtub curve. (6 marks)
- (d) Historically, an equipment has a MTBF = 200 days. To improve 10% its reliability to operate on a 100 days run, what percent should MTBF be improved? (3 marks)

As per the manufacturer, an equipment has a 90% reliability to run over one year. If you want to have a 95% confidence that it will not fail, how long should it take until the equipment undergoes a Preventive maintenance or some predictive technique? (3 marks)

### Question FOUR

- (a) Outline the 3 basic conditions needed to ensure successful maintenance of assets. (3 marks)
- (b) Discuss the concepts behind: (6 marks)
- i. Failure based maintenance
  - ii. Use based maintenance.
  - iii. Condition based maintenance.
- (c) Briefly discuss 6 roles of an employee with regard to OSHA. (6 marks)
- (d) List the 5 different types of inspections that may be undertaken by OSHA agents. (5 marks)

### Question FIVE

- (a) Discuss the following concepts with regard to accidents prevention: (6 marks)
- i. Primary prevention,
  - ii. Secondary prevention,

iii. Tertiary prevention.

(b) Outline three important factors that an engineer should be aware of in order to prevent occurrence of accidents resulting from fires and explosions. (3 marks)

(c) With the aid of a well labeled diagram, illustrate the “fire triangle”. (6 marks)

(d) Identify 3 types of fires and recommend the types of fire extinguishers that can be used to control them. (5 marks)