TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied and Health Sciences
Department of Mathematics & Physics
UNIVERSITY EXAMINATION FOR:
BTech Renewable Energy & Environmental Physics
EME 4301 : Creative Mechanical Engineering (Paper 2)
SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: SEPTEMBER 2018
TIME: 2 HOURS
DATE: Pick Date **Sep 2018**

Instruction to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Non-Programmable scientific calculator*

This paper consists of **FIVE** questions. Attempt question **ONE** and any other **TWO** questions.

Maximum marks for each part of a question are as shown.

Do not write on the question paper.

Question ONE

(a) Define the following: (6 marks)

i. Conservative force.
ii. Potential energy.
iii. Kinetic energy.

(b) Differentiate energy conversion from energy efficiency. (4 marks)

(c) With moderate winds, a modern large wind turbine can generate about 250 kW of electricity, whereas a large nuclear power plant can generate 1,000 MW. (10 marks)

i. Assuming that the wind turbine has an approximate efficiency of 40 %, how many wind turbines would be required to give the same output as one nuclear power plant?
ii. Discuss 2 advantages and 2 disadvantages to providing electrical power by each method.

Question TWO

(a) Outline 3 objectives of laboratory corrosion testing. (6 marks)

(b) Briefly discuss the following: (9 marks)

i. Thermal stress relief.
ii. Mechanical stress relief.
iii. Corrosion allowance.

(c) Outline 5 functions/qualities of coatings with regard to corrosion protection. (5 marks)

Question THREE

(a) Briefly discuss the 5 steps to mass production. (10 marks)

(b) State 3 interrelated factors that influence the design of an engineering component. (3 marks)

(c) Discuss the following 3 basic steps of material selection: (7 marks)

i. Translation.
ii. Screening
iii. Ranking.

Question FOUR

(a) Explain the term "plant layout". (2 marks)

(b) Identify 3 determinants of a plant layout. (6 marks)

(c) Briefly discuss the following principles with regard to plant layout. (8 marks)

i. Principle of space.
ii. Principle of safety.
iii. Principle of flexibility.
iv. Principle of overall integration.

(d) Outline 2 importance of lighting and ventilation to a building. (4 marks)

Question FIVE

(a) Define 'sustainability' and list 3 variables that dictate engineering sustainability. (5 marks)

(b) Briefly discuss the following: (6 marks)

i. Free and forced vibrations.
ii. Linear and non-linear vibrations.
iii. Damped and un-damped vibrations.

(c) Outline 3 advantages and 3 disadvantages of computer aided drawing. (9 marks)