TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA MARINE ENGINEERING

EMR 2112 : MARINE ENGINEERING SCIENCE 2

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: Pick Date May 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.

Question ONE:

a) Explain what simple machines are. **10 marks**

b) Explain the working principles of the following simple machines:

i) Lever

ii) Pulleys **10 marks**

Question TWO:

a) Briefly explain the following forms of Energy:

i) Electrical Energy

ii) Chemical Energy

iii) Radiant Energy **10 marks**

b) i) State the Lenz's law.

ii)Explain the application of Electromagnetic induction by the use of a DC Generator.

10 marks

Question THREE:

a) A sinusoidal electromagnetic wave of frequency 40.0 MHz travels in free space in the *x* direction.

i) Determine the wavelength and period of the wave.

ii) At some point and at some instant, the electric field has its maximum value of 750 N/C and is along the *y* axis. Calculate the magnitude and direction of the magnetic field at this position and time.

iii) Write expressions for the space–time variation of the components of the electric and magnetic fields for this wave. **12 marks**

b)i) Define the term, Energy.

ii) State the Principle of Conservation of Energy. **3 marks**

iii)In a horizontal pinball machine the spring is compressed 7cm. If the mass of the ball is 40g and the stiffness of the spring is 870Nm^{-}, what is the speed of the ball when it leaves the spring assuming that friction can be neglected? **5 marks**

Question FOUR:

a) Define the following Electromagnetic Radiation terms: i) Wavelength
ii) Frequency
iii) Electromagnetic radiation
iv) Wavenumber **8 marks**

b) Calculate the frequency of electromagnetic radiation that has a wavelength of 1.315μm. Also find the frequency of infrared radiation of wavelength 67.5μm. **6 marks**

c) Write **(DO NOT DERIVE)** the four Maxwell's equations. **6 marks**

Question FIVE:

a) Define the following simple machines terms:
i) Work
ii) Load
iii) Effort
iv) Actual Mechanical Advantage **8 marks**

b) Define the following Electromagnetic properties:
i) Relative permeability
ii) Reluctance
iii) Magnetomotive Force (mmf)
iv) Magnetizing Force (H)
v) Electromagnetic Induction **10 marks**

c) State Faraday's law of electromagnetic induction. **2 marks**