NATIONAL OPEN UNIVERSITY OF NIGERIA

Plot 91, Cadastral Zone, NnamdiAzikwe Expressway, Jabi, Abuja.

FACULTY OF SCIENCES

April/May Examination 2019

Course Code: **MTH417**
Course Title: **Electromagnetic Theory**
Credit Unit: **3**
Time allowed: **3 HOURS**
Total: **70 Marks**
Instruction: **ATTEMPT NUMBER ONE (1) AND ANY OTHER (4) QUESTIONS**

1. (a) State Maxwell's equation (5 marks)

   (b) Explain what is a constitutive relation in electromagnetic (5 marks)

   (c) Write the Maxwell's equations in both the Integral and differential forms (7 marks)

   (d) What does the continuity equation state (5 marks)

2. (a) Relates Gauss's law to Maxwell's equations (6 marks)

   (b) Which of Maxwell's equation is known as Faraday's law (2 marks)

   (c) Explain Ampere's law. What role does it play in electromagnetic theory (4 marks)

3. (a) Prove that light is electromagnetic wave (5 marks)

   (b) What is the orientation of the electric and magnetic field vectors of an electromagnetic wave relative to its direction of propagation (5 marks)

   (c) At what speed does electromagnetic wave travel through vacuum? (2 marks)

4. (a) Light waves are transverse waves. Explain (6 marks)

   (b) What do you understand by "relaxation time" of a conducting medium (6 marks)

5. (a) Derive an expression for Snell's law. (6 marks)

   (b) Describe Poynting's vector and relate it to solar radiation. (6 marks)

6. (a) State the energy theorem. (6 marks)

   (b) Derive the Lorentz Transformation. (6 marks)