

## NATIONAL OPEN UNIVERSITY OF NIGERIA

Plot 91, Cadastral Zone, Nnamdi Azikwe Expressway, Jabi, Abuja.

## FACULTY OF SCIENCES DEPARTMENT OF MATHEMATICS

## Examination 2021\_2

Credit Unit:	3	
Time Allowed:	3 Hours	
<b>Instruction:</b>	Attempt Number One (1) and Any Other (4) Question	ons
1. (a) What	forms the basis of classical electrodynamics, cl	lassical optics and electric
circuits?		
		(3 marks)
(b) Descri	be the combined force law known as Lorentz force	(4 marks)
` '	the four fundamental constitutive relationships to a variety of electromagnetic input.	describe the response of a (4 marks)

(d) Define each of the following:

**MTH 417** 

**Electromagnetic Theory** 

**Course Code:** 

**Course Title:** 

(i) Gauss's law(4 marks)(ii) Ampere's law(3 marks)(iii) Faraday's law(4 marks)

2. (a) Define Maxwell's macroscopic equations

(3 marks)

- (b)In the mid -1800's, the theories of electricity and magnetism were united by James Clerk Maxwell in four equations. State them! (6 marks)
- (c) Differentiate between Source and Sink in relation to net change inside a surface.

(3 marks)

- 3. (a) Differentiate between the dielectric constant and magnetic permeability (4 marks)
  - (b) State the Gauss's divergence theorem and Stokes

(8 marks)

4. (a) State the kinetic energy of a particle.

(4 marks)

(b) How are Maxwell's equations used to show wave motion?

(8 marks)

5. (a) Describe briefly the reflection and refraction at a boundary between dielectrics.

(10 marks)

(b) Using a simple equation, describe the energy theorem in Maxwell's theory (2 marks)

6. (a) Define each of the following:

(i) Electric field energy (2 marks)

(ii) Magnetic field energy (2 marks)

(iii) Power flux (2 marks)

(b) State the momentum theorem in Maxwell's theory in a vacuum. (3 marks)

(b) Briefly describe the refractive index in a medium. (3 marks)

