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## NATIONAL OPEN UNIVERSITY OF NIGERIA

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

## FACULTY OF SCIENCES DEPARTMENT OF MATHEMATICS

September Examination 2020\_1

Course Code:	MTH 417
<b>Course Title:</b>	Electromagnetic Theory
Credit Unit:	3
Time Allowed:	3 Hours
Instruction:	Attempt Number One (1) and Any Other (4) Questions

1. (a) What forms the basis of classical electrodynamics, classical optics and electric circuits?

		(3 marks)	
	(b) Describe the combined force law known as Lorentz force	(4 marks)	
	(c) State the four fundamental constitutive relationships to	describe the response of a	
	medium to a variety of electromagnetic input.	(4 marks)	
	(d) Define each of the following:		
	(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 may		tism were united by James	
	Clerk Maxwell in four equations. State them!	(6 marks)	
	(c) Differentiate between Source and Sink in relation to net ch	ange 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)

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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)