



NATIONAL OPEN UNIVERSITY OF NIGERIA
University Village, Plot 91, Cadastral Zone, Nnamdi Azikwe Express Way, Jabi-Abuja

FACULTY OF SCIENCES
2021 Examinations

Course Code: MTH417
Course Title: Electromagnetic Theory
Credit Unit: 3
Time Allowed: 3 Hours
Total: 70 Marks
Instruction: Answer Question One (1) and Any Other 4 Questions

1. (a) State the free-space set (differential and integral forms) of Maxwell's equations
(11 marks)
(b) Given $H = H_m e^{i(\omega t + \beta z)} a_x$ in free space, find E .
(11 marks)
2. Given the equation $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$ for electric field intensity, derive the wave equation for \vec{E} .
(12 marks)
3. From the Maxwell's equations, derive the wave equation for the magnetic field \vec{B} .
(12 marks)
4. Given $E = E_m \sin(\omega t - \beta z) a_y$ in a free space, find D, B and H
(12 marks)
5. Show that $E = E_m \sin(\omega t - \beta z) a_y$ and $H = -\frac{\beta E_m}{\omega \mu_0} \sin(\omega t - \beta z) a_x$ fields constitute a wave traveling in the z-direction. Verify that the wave speed and E/H depend only on the properties of free space.
(12 marks)
6. State the general set (differential and integral forms) of Maxwell's equations
(12 marks)