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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA**

**FACULTY OF SCIENCE**

 **JULY 2017­\_1 EXAMINATION**

Course Code: **PHY404**

 Course Title: **ELECTRODYNAMICS III**

Credit Unit 3

 Time: 3 hour

Instruction: **ANSWER QUESTION ONE AND ANY FOUR QUESTIONS.**

1a. State the Maxwell’s equations in differential form. State what the symbols stand for.

(4 marks)

b. i. Define (i) skin depth (ii) skin effect (5 marks)

 ii. Determine the skin depth when the frequency is 60Hz (5 marks)

2a Mention three ways an electromagnetic wave can be polarized and explain the nature of oscillation of the electric field E in each case. (9 marks)

b Define an isotropic medium. Give an example. (5 marks)

3a. Explain the term “transmission line”. (4 marks)

3b. i. Define Resonance (4 marks)

 ii. The aerial circuit of a radio set is equipped with a tuning coil of inductance 1.8mH. What value of tuning capacitor must be used with this to tune to the BBC long wave station 200 kHz? (6 marks)

4a. Using the Maxwell’s equation show that the wave equation for electric and magnetic fields are given by

$ ∇^{2}E=\frac{1}{C^{2}}\frac{d^{2}E}{dt^{2}}and ∇^{2}B=\frac{1}{C^{2}}\frac{d^{2}B}{dt^{2}}$ (10 marks)

b. State the two boundary conditions on the planes for the transmission of waves in a pair of parallel conducting planes. (4 marks)

5a. Show that the natural angular frequency, ω, of resonant circuit is given by $w=\frac{1}{\sqrt{LC}}$

(7 marks)

5b. (a) Define reflection coefficient (R) and transmitted coefficient (T) (3 marks)

(b) Given that the refractive index, η, of water for wave of frequency 100mHz is a 9. Calculate the reflection and transmission coefficient of the medium. (4 marks)