



ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE

FACULTY OF ENGINEERING

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS
ENGINEERING**

FIRST SEMESTER EXAMINATION 2018/2019 ACADEMIC SESSION

COURSE TITLE: ANTENNA AND PROPAGATION

COURSE CODE: EEE 413

EXAMINATION DATE:

COURSE LECTURER: PROF. SOLOMON ADENIRAN

A handwritten signature in black ink is enclosed within a rectangular box. The signature is stylized and appears to be the name of the Head of Department.

HOD'S SIGNATURE

TIME ALLOWED: 3 HOURS

INSTRUCTIONS:

- 1. ANSWER FOUR (4) QUESTIONS**
- 2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING,
POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.**
- 3. YOU ARE NOT ALLOWED TO BORROW ANY WRITING MATERIAL
DURING THE EXAMINATION.**

1.
 - a. Write down the Maxwell's equation.
 - b. Derive the wave equation from the Maxwell's equation. 3mp.
 - (c.) A communication link between two vertical $\pi/2$ dipole antennas is established with a free space environment. If the transmitter delivers 1 KW of power to the transmitting antenna, how much power will be received by a receiver connected to the receiving dipole 500Km from the transmitter if the frequency is 200 MHz? Assume that the path between dipoles is normal to each dipole (i.e $\theta = 90^\circ$)

- 2.(a) The r.m.s. antenna current of a radio transmitter is 10A when unmodulated rising to 12 A when the carrier is sinusoidally modulated. Calculate the modulation index.

- 3.(a) A constant amplitude 2KHz sine wave is used to phase modulate a carrier. At some time the frequency of the modulating signal is increased to 5 kHz. Explain what happens to the output signal from a receiver used to receive the modulated wave?
 - (b) An antenna has a gain of 44dB. Assuming that the main beam of the antenna is circular in cross section, find the beamwidth, θ_B .
 - (b) A 15W unmodulated carrier is frequency modulated with a sinusoidal signal the peak frequency deviation is 6 KHz, the frequency of the modulating signal is 1 KHz. Calculate the average power output.

- 4a. A charged sphere has a radius of 3m and contain a volume of charge density of

$$\rho = 5.3124 \times 10^{-11} \text{ r}^3 \text{ C/m}^3$$
 Using gauss's law, find
 - (I) An expression for the electric field at a point inside the sphere
 - (ii) An expression for the electric field at point outside the sphere

- b. An E field given by $\hat{x}100e^{\gamma z}$ V/m is traveling through a material ($\epsilon = 4$, $\sigma = 0.1 \text{ S/m}$, $\mu = \mu_0$) and the frequency is 2.45 GHz. Find α and β and the decibels per meter attenuation in the material

- 5(a) Discuss the coherent detection of DSB-SC modulated wave with a block diagram and explain its operations
 - (b) Draw the block diagram for the generation and demodulation of a VSB signal?

6. Draw a circuit for the modulation of $A \sin Kt$ for a carrier $50 \sin 1000\pi t$. Briefly describe what has been done to achieve this circuit. State any assumptions?