



ELIZADE UNIVERSITY

ILARA-MOKIN

ONDO STATE

**FACULTY: BASIC AND APPLIED SCIENCES
DEPARTMENT: PHYSICAL AND CHEMICAL SCIENCES
FIRST SEMESTER EXAMINATIONS
2017/2018 ACADEMIC SESSION**

COURSE CODE: PHY 301

COURSE TITLE: ELECTROMAGNETIC THEORY 1

DURATION: 2 HOURS

HOD's SIGNATURE

TOTAL MARKS:

Matriculation Number: _____

INSTRUCTIONS:

1. Write your matriculation number in the space provided above and also on the cover page of the exam booklet.
2. This question paper consists of 2 pages with printing on both sides.
3. Answer all questions in the examination booklet provided.
4. More marks are awarded for problem solving method used to solving problems than for the final numerical answer.
5. Box your final answers.
6. **Attempt any 4 of the 6 questions**

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- 1a(i) State the Coulombs law
- (ii) Given point P (1,-3,5), Q(2,4,6) and R(0,3,8). Find (i) the position vectors of P and R (ii) distance vector QR and distance between QR
- (b) Point charges 2mC and -3mC are located at (3,2,-1) and (-1,-1,4) respectively. Calculate the electric force on a 10nC charge located at (0,3,1) and the electric field intensity.
- 2(a)(i) What is electric flux line
- (ii) Define clearly the electric flux of the uniform electric field E passing through an area A at various inclinations with the field.
- (b) (i) State and prove the differential form of gauss's law .
- (ii) Three point charges -1nC, 4nC and 3nC are located at (0,0,0), (0,0,1) and (1,0,0) respectively. Find the energy in the system .
- 3(a)(i) State the principle of superposition as applied to N number of charges.
- (ii) A solid sphere of radius R is uniformly charged with a constant volume density ρ . Find the electric field inside ($r < R$) and outside ($r > R$) the solid sphere.
- (b) If $V = x - y + xy + 2z$ V , find E at (2,3,4)
- 4(a)(i) State Ampere's Law. What are the two situations that validate Ampere's law.
- (ii) A total current I is distributed uniformly over the cross-section of a long cylindrical conducting shell having an inner radius a and an outer radius b. Find the magnitude of the field due to current at a point a radial distance r from the axis of the shell. ($a \leq r \leq b$).
- (b) A particle with a charge of $10^{-17}C$ and a mass of $10^{-26}kg$ is at rest on free space field. If a uniform electric field $E = 1KVm^{-1}$ is applied for $1\mu S$ determine (i) The velocity of the particle (ii) The radius of curvature of the particle if it enters a magnetic field $B = 2mT$.
- 5(a) (i) Define magnetic flux density (B).
- (ii) Find the inductance of an ideal solenoid with 300 turns, length 0.5m and a circular cross-sectional radius 2cm.
- (b) Determine the self - inductance of a solenoid that have n loop per unit length . The solenoid is 1m long and has a radius of R. State the significance of the result .
- 6(a) (i) State the Biot-savart law .
- (ii) Describe the force between two wires separated by distance d , if they are carrying currents in the same direction and also in opposite directions.
- (b) Three long parallel wires each carry current 20 A in the direction shown in the figure below. What force is exerted on each length of 1m of wire (3)