

AMIETE – ET (CURRENT & NEW SCHEME)

Time: 3 Hours

DECEMBER 2015

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following: (2×10)

- a. Stoke's theorem relates _____ integral to a _____ integral.
 (A) volume, surface (B) volume, line
 (C) line, surface (D) all of these
- b. Which of the following is true?
 (A) $\vec{E} = -\nabla V$ (B) $\vec{E} = -\nabla \cdot V$
 (C) $\vec{E} = -\nabla \times V$ (D) None of these
- c. The magnetic field intensity (in A/m) at the centre of a circular coil of diameter 1 metre and carrying current of 2 A is
 (A) 8. (B) 4.
 (C) 3. (D) 2.
- d. The magnitude of ratio of conduction current density to the displacement current density when $\vec{E} = E_0 \sin \omega t$ is (Where symbols have their usual meaning)
 (A) $\sigma/\omega\epsilon$ (B) $\sigma\omega/\epsilon$
 (C) $\sigma\epsilon/\omega$ (D) None of these
- e. Acc to _____ Law, induced current act to produce an opposite flux.
 (A) Bio-Savart's (B) Lenz's
 (C) Ampere's (D) Faraday's
- f. Point charges 30 nC, -20 nC and 10 nC are located at (-1, 0, 2), (0, 0,0) and (1, 5, -1) respectively. The total flux leaving a cube of side 6m centered at the origin is
 (A) -20 nC (B) 10 nC
 (C) 20 nC (D) 30 nC
- g. Divergence theorem is applicable for
 (A) static field only
 (B) time varying fields only
 (C) both static and time varying fields
 (D) Electric fields only

Code: AE63/AE114 Subject: ELECTROMAGNETICS & RADIATION SYSTEMS

- h. Some unknown material has a conductivity of 10^6 mho m^{-1} , and a permeability of $4\pi \times 10^{-7}$ H/m. The skin depth for the material at 1 GHz is
 (A) 15.9 μm (B) 20.9 μm
 (C) 25.9 μm (D) 30.9 μm
- i. If the antenna diversity and antenna gain are equal then antenna efficiency is _____%?
 (A) 20 (B) 50
 (C) 75 (D) 100
- j. The unit of $\nabla \times \vec{H}$ is
 (A) A (B) A/m
 (C) A/m^2 (D) Am

**Answer any FIVE Questions out of EIGHT Questions.
 Each question carries 16 marks.**

- Q.2** a. Define the electric field intensity. Find the electric field intensity at a point P lying at a distance from an infinite straight uniform charged wire. (8)
 b. State and prove divergence theorem. (8)
- Q.3** a. State and explain the boundary condition at the interface of two dielectrics in an electrostatic field. (8)
 b. Drive the equation for the energy density in an electrostatics. (8)
- Q.4** a. Derive Poisson's and Laplace's equation. (8)
 b. Derive Laplace's equation for parallel plate capacitor in rectangular coordinate and determine C there from. (8)
- Q.5** a. Using Ampere's law, calculate the magnetic field intensity at a point due to line current placed along the z-axis extending from $-\infty$ to ∞ . (8)
 b. Apply Biot-Savart's law to calculate magnetic field of a circular current carrying loop. (8)
- Q.6** a. Find the force between an infinite straight line wire carrying a current I_1 , and a square loop of side a with current I_2 , the extended plane of loop containing the straight line wire. The shortest distance from the wire to the loop is d and the wire lies parallel to one side of the loop. (8)
 b. Write note on. (8)
 (i) Hysteresis loss
 (ii) Retarded potential
- Q.7** a. Explain the concept of "Displacement current". How is this current different from Conduction current? (8)
 b. Derive the Maxwell's equation for static and time varying electric field. (8)
- Q.8.** a. Define the terms "Virtual height", "Critical frequency" and "Skip distance". (8)
 b. Assume the reflection takes place at a height of 400km and that the maximum density in the ionosphere corresponds to a 0.9 refractive index at 10 MHz. What will be the range for which the MUF is 10 MHz? Assume flat earth. (8)
- Q.9** a. State Babinet principal and explain how it gives rise to the concept of complementary antenna? (8)
 b. Write short note on: (8)
 (i) Marconi antenna & Hertz antenna (ii) YAGI_UDA antenna.