Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 20413

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Fourth Semester

Electronics and Communication Engineering

EC 6403 — ELECTROMAGNETIC FIELDS

(Regulations 2013)

(Common to PTEC 6403 — Electromagnetic Fields for B.E. (Part-Time) Third Semester – Electronics and Communication Engineering – Regulations 2014)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State divergence theorem.
2. Specify the applications of Gauss law.
3. Define magneto static vector potential.
4. Mention the Laplace equation in electromagnetic field.
5. What is meant by Biot-Savart Law?
6. State stokes theorem.
7. Outline the Amperes law of force between current carrying conductors.
8. Determine the force and torque in terms of mutual inductance.
9. Relate electrostatic and Magneto static models.
10. Outline the fundamental postulate for Electromagnetic Induction.

PART B — (5 × 13 = 65 marks)

11. (a) Illustrate in detail about the coulomb's law in electric fields. (13)

Or

(b) Determine the electric field intensity of an infinitely long, straight line charge of a uniform density ρ in air. (13)

12. (a) Derive the boundary conditions for electrostatic fields. (13)

Or

(b) A parallel plate capacitor consists of two parallel conducting plates of area S separated by a uniform distance d. The space between the plates is filled with a dielectric of a constant permittivity, ϵ. Determine the capacitance. (13)

13. (a) An infinitely long, straight conductor with a circular cross section of radius b carries a steady current I. Determine the magnetic flux density both inside and outside the conductor. (13)

Or

(b) Derive the vector magnetic potential. (13)

14. (a) Find the inductance per unit length of a very long solenoid with air core having 'n' turns per unit length. (13)

Or

(b) Determine the force per unit length between two infinitely long parallel conducting wires carrying currents I_1 and I_2 in the same direction. The wires are separated by a distance d. (13)

15. (a) Derive the integral form of Maxwell's equations. (13)

Or

(b) A circular loop of N turns of conducting wire lies in the xy-plane with its center at the origin of a magnetic field specified at the origin of a magnetic field specified by $B = a_z B_0 \cos(\pi/2b) \sin \omega t$, where '$b$' is the radius of the loop and ω is the angular frequency. Find the emf induced in the loop. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Express $3\cos \omega t - 4 \sin \omega t$, as first (i) $A_1 \cos(\omega t + \theta_1)$ and then (ii) $A_2 \sin(\omega t + \theta_2)$. Determine A_1, θ_1, A_2 and θ_2. (15)

Or

(b) A rectangular loop in the xy-plane with sides b_1 and b_2 carrying a current I lies in a uniform magnetic field $B = a_x B_x + a_y B_y + a_z B_z$. Determine the force and torque on the loop. (15)