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

Question Paper Code : 23495

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

Third Semester

Electrical and Electronics Engineering

EE 2202 – ELECTROMAGNETIC THEORY

(Regulations 2008)

[Common to PTEE 2202 – Electromagnetic Theory for B.E. (Part – Time) Second Semester – EEE – Regulations 2009]

Time : Three hours Maximum : 100 marks

(Codes / Tables / Charts to be permitted, if any, may be indicated)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Points P and Q are located at (0, 2, 4) and (–3, 1, 5), calculate the distance between P and Q.
2. State Stoke's theorem.
3. State Gauss law.
4. Define electric potential.
5. State Ampere's law.
6. Classify materials in terms of their magnetic properties.
7. Write transformer emf equation.
8. Write displacement current equation. Where does it occur?
9. Define pointing vector.
10. Define standing wave ratio.

PART B — (5 × 16 = 80 marks)

11. (a) Express vector $B = \frac{10}{r} a_r + r\cos\theta\, a_\theta + a_\varphi$ in Cartesian and cylindrical coordinates. Find $B(-3, 4, 0)$ and $B(5, \pi/2, -2)$.

Or

(b) Define divergence and derive the expression for divergence.

12. (a) (i) Point charges 1 mC and –2 mC are located at $(3, 2, -1)$ and $(-1, -1, 4)$, respectively. Calculate the electric force on a 10 nC charge located at $(0, 3, 1)$ and the electric field intensity at that point. (8)

(ii) The finite sheet $0 \le x \le 1, 0 \le y \le 1$ on the $z = 0$ plane has a charge density $\rho_s = xy\left(x^2 + y^2 + 25\right)^{\frac{3}{2}}$ nC/m^2. Find the total charge on the sheet. (8)

Or

(b) If a sphere of radius a with a uniform charge ρ_v C/m^3, determine D everywhere.

13. (a) A circular loop located on $x^2 + y^2 = 9$, $z = 0$ carries a direct current of 10 A along a_ϕ. Determine H at $(0, 0, 4)$, and $(0, 0, -4)$.

Or

(b) If an infinitely long transmission line consisting of two concentric cylinders having their axes along the z axis, determine H everywhere. The inner conductor has radius a and carries current I while the outer conductor has inner radius b and thickness t and carries return current – I.

14. (a) Determine the magnetic field intensity (H) and Magnetic flux density (B) for two different dielectric medias.

Or

(b) Derive the modified Maxwell's magnetic curl equation from continuity of current equation and explain the concept with an example.

15. (a) A plane wave propagating along the +z direction is incident normally on the boundary $z = 0$ between medium $1(z < 0)$ characterized by $\sigma_1, \varepsilon_1, \mu_1$ and medium $2(z > 0)$ characterized by $\sigma_2, \varepsilon_2, \mu_2$. Derive

(i) The incident, reflected and transmitted wave equations,

(ii) Refection coefficient, transmission coefficient and their relations. (2 × 8 = 16)

Or

(b) Derive wave equation for a charge free, linear, homogeneous, and lossy dielectric medium. For the same medium, write the field equations, propagation constant, attenuation and phase constants, and impedance of the medium.