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Question Paper Code : 60498

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Third Semester

Electrical and Electronics Engineering

EE 2202/EE 34/10133 EE 303/080280017 – ELECTROMAGNETIC THEORY

(Regulations 2008/2010)

(Common to PTEE 2202 — Electromagnetic Theory for B.E. (Part-Time) Second Semester – Electrical and Electronics Engineering – Regulations 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the Stoke's theorem.

2. Obtain in the cylindrical co-ordinate system the gradient of the function $f(r, \theta, z) = 5r^4 z^3 \sin\theta + \cos\theta + z^2$.

3. Define electric potential and potential difference.

4. Name few applications of gauss law in electrostatics.

5. State Biot-Savart's law.

6. Define magnetic moment.

7. A parallel plate capacitor has an electrode area of 10 cm^2. The separation between the plates is 5 mm. A voltage of 10 sin 100 πt is applied across its plates. Calculate its displacement current. Assume air dielectric.

8. State: Poynting Theorem.

9. What is 'voltage reflection coefficient' at the load end of a transmission line?

10. Define 'Intrinsic impedances'.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Obtain the Curl in the spherical Co-ordinate system. (8)

(ii) Transform the vector $A = 3i - 2j - 4k$ at $p(x = 2, y = 3, z = 3)$ to Cylindrical Co-ordinate. (8)

Or

(b) Derive the Laplace's Equation. Obtain the Laplacian's operator in the cylindrical coordinate system. (6 +10)

12. (a) (i) Consider a square of side 5 cm. Three positive charges of 100 nC each are located at three corners of the square. Find the value of the electric field intensity at the fourth corner of the square. (8)

(ii) Find the electric field due to a uniform line charge. (8)

Or

(b) Conducting spherical shells with radii a = 8 cm and b = 20 cm are maintained at a potential difference of 100 V such that $V(r=b)=0$ and $V=(r=a)=70V$. Determine V and E in the region between the shells. If $\varepsilon_r = 2$ in the region determine the total charge induced on the shells and the capacitance of the capacitor. (16)

13. (a) Derive a general expression for the magnetic flux density B at any point along the axis of a long Solenoid. Sketch the variation of B from point to point along the axis. (16)

Or

(b) (i) For an infinite current sheet of uniform current density 'K' A/m, derive the expression for the magnetic field intensity. (6)

(ii) A coil has 1000 turns and carries a magnetic flux of 10 mWb. The resistance of the coil is 4Ω. If it is connected to a 40 V DC supply, estimate the energy stored in the magnetic field when the current has attained its final study value. Derive the formula used. (5 + 5)

14. (a) Derive and explain Maxwell's equations both in integral and point forms. (16)

Or

(b) Obtain the expression for energy stored in the magnetic field and also derive the expression for magnetic energy density. (16)

15. (a) Briefly explain about the wave incident

(i) Normally on perfect conductor. (8)

(ii) Obliquely to the surface of perfect conductor. (8)

Or

(b) (i) Write note on standing wave ratio. (8)

(ii) A circular loop conductor lies in plane z = 0 and has a radius of 0.1 m and resistance of 5 ohms. Given B = 0.2 sin 103t a_z, determine current in the loop. (8)
