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

Question Paper Code: 44403

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Fourth Semester

Electronics and Communication Engineering

14UEC403 - ELECTROMAGNETIC FIELDS

(Regulation 2014)

Duration: Three hours | Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Discuss-Charged line

   (a) Infinitesimal charge elements (b) Enlarged charge elements
   (c) Supreme Charged elements (d) None of the above

2. A scalar is a quantity which is completely characterized by its

   (a) Direction (b) Magnitude
   (c) Direction and magnitude (d) None of the above

3. The Magnetic field at any point on the axis of a current carrying circular coil will be

   (a) Perpendicular to the axis (b) Parallel to the axis
   (c) At an angle of 45 degree with the axis (d) Zero

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5. Point form of Ohm's law is

   (a) $\vec{E} = \sigma \vec{J}$ (b) $\vec{J} = \sigma \vec{E}$ (c) $\vec{E} = \vec{J}$ (d) $\vec{E} = \frac{\sigma}{\vec{J}}$

6. In a dielectric-conductor boundary, the tangential component of electric field is

(a) E_i (b) $2E_i$ (c) 0 (d) Infinity

7. The Coefficient of coupling between two coils

(a) Orientation of the coils (b) Current
(c) Number of turns on the two coils current (d) Self-inductance of the two coils

8. Give the equation of power flow in coaxial cable

(a) Poynting Vector (b) Scalar Vector
(c) Radial Vector (d) none of these

9. What is skin effect?

(a) High Frequency AC (b) Low frequency AC
(c) Very Low Frequency AC (d) none of these

10. Discuss on brewster angle

(a) Polarization angle (b) Reflection angle
(c) Refraction angle (d) none of these

PART - B (5 x 2 = 10 Marks)

11. Define divergence theorem.

12. Define Ampere's circuital law.

13. Define mutual inductance.

14. State Poynting theorem.

15. Mention the properties of uniform plane wave.

PART - C (5 x 16 = 80 Marks)

16. (a) Discuss and obtain an expression for incremental length, surface area and volume integrals. And also state divergence theorem. (16)

Or

(b) State and prove Gauss law with applications. (16)

17. (a) In cylindrical co-ordinates, $A=50r^2a_z\ wb/m$ is a vector magnetic potential in a certain region of free space. Find the H, B and J. (16)

Or

(b) Prove Ampere's circuital law. Derive an expression for vector magnetic potential. (16)

18. (a) Solve the Laplace equation for the potential field in the homogenous region between the two concentric conducting spheres with radius a and b where $b>a$ $v=0$ *at* $r=b$ and $V=Vo$ *at* $r=a$. Find the capacitance between the two concentric spheres. (16)

Or

(b) A cylindrical capacitor consists of an inner conductor of radius 'a' and an outer conductor whose inner radius is 'b'. The space between the conductor is filled with a dielectric of permittivity ε, and the length of the capacitor is L. Determine the capacitance of this capacitor. (16)

19. (a) Derive Maxwell's four equations in Integral form and Differential form. (16)

Or

(b) (i) Explain about power flow in a coaxial cable. (10)

(ii) Find the displacement current at t = 0 passing in an aluminium conductor of circular cross section having a total resistance of 0.15 Ω and voltage of 100 *sin* $(10^6 \pi t)$ volts across it. Given $\sigma = 3.5 \times 10^7$ $\mho/m$ and $\varepsilon_r = 1$. (6)

20. (a) Derive wave equation in a conducting medium. (16)

Or

(b) Derive the transmission and reflection coefficient for the electromagnetic waves when incident normally on perfect dielectric. (16)

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