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Question Paper Code: 44043

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

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. Give the lorentz force equation

(a) $F=qE+qv \times B$

(b) $F=Eq+B$

(c) $F=B+Qx$

(d) none of these

4. The unit of magnetic flux density is

(a) Henry/m

(b) Ampere/m

(c) Coulomb/m

(d) Tesla

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) $\vec{E} = \frac{\sigma}{J}$

6. Example of super paramagnetic materials is
 (a) Iron (b) Cobalt (c) Oxides (d) Magnetic tape
7. Give the equation of power flow in coaxial cable
 (a) Poynting Vector (b) Scalar Vector (c) Radial Vector (d) None of these
8. Unit of Poynting vector is
 (a) VA/m (b) VA (c) VA/m² (d) Watt/m
9. What is skin effect?
 (a) High Frequency AC (b) Low frequency AC
 (c) Very Low Frequency AC (d) none of these
10. Skin depth is proportional to
 (a) Frequency (b) permeability (c) $\sqrt{\sigma}$ (d) $1/\sqrt{\sigma}$

PART - B (5 x 2 = 10 Marks)

11. List the principles of superposition.
12. Define Ampere's circuital law.
13. A solenoid has an inductance of $20mH$. If the length of the solenoid is increased by two times and the radius is decreased to half of its original value, find the new inductance.
14. What is displacement current?
15. Define depth of penetration.

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

Or

(b) 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)

18. (a) (i) Let us assume $\mu = \mu_1 = 4 \mu H/m$ in region 1 where $z > 0$, while $\mu_2 = 7 \mu H/m$ in region 2 wherever $z < 0$. Moreover, let $K = 80 \vec{a}_x$ A/m on the surface $z = 0$. $\vec{B}_1 = (2\vec{a}_x - 3\vec{a}_y + \vec{a}_z)$ mT , in region 1 and find the value of \vec{B}_2 . (12)

(ii) Find the inductance per unit length of the coaxial cable. It is having $a = 2$ mm and $b = 4$ mm . Assume free space medium and omit internal inductance. (4)

Or

(b) Obtain the boundary conditions of normal and tangential components of magnetic field at the interface of two media with different permeabilities. (16)

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

Or

(b) Derive the Poynting vector from Maxwell's equations and explain power of flow. (16)

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

Or

(b) Define Brewster angle. Derive the wave equation in free space condition. (16)
