Reg. No. :

Question Paper Code: 41443

B.E. / B.Tech. DEGREE EXAMINATION, MAY 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. A field F is said to be SOLENOIDAL if

    (a) CURL F=0   (b) DIV F=0   (c) $\nabla^2 F = 0$ (d) $\int$ F.dl = 0

2. The force per unit charge is defined as

    (a) electric field   (b) electric field intensity
    (c) magnetic field   (d) flux density

3. The unit of magnetic flux density is

    (a) Henry/m   (b) Ampere/m   (c) Coulomb/m   (d) Tesla

4. 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

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

6. Example of super paramagnetic materials is

    (a) iron   (b) cobalt   (c) oxides   (d) magnetic tape

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

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

8. Unit of Poynting vector is

    (a) VA/m   (b) VA   (c) VA/m^2 (d) Watt/m

9. Skin depth is proportional to

    (a) Frequency   (b) permeability   (c) $\sqrt{\sigma}$ (d) $1/\sqrt{\sigma}$

10. Conductivity of perfect dielectric is

    (a) unity   (b) 0.5   (c) $\dfrac{1}{\sqrt{2}}$ (d) zero

PART - B (5 x 2 = 10 Marks)

11. Define divergence theorem.

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. State Poynting theorem.

15. Mention the properties of uniform plane wave.

PART - C (5 x 16 = 80 Marks)

16. (a) Determine the electric field intensity of an infinitely long, straight, line charge of a uniform density ρ_L in air.   (16)

Or

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

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

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(b) State and prove Ampere's circuital law with applications. (16)

18. (a) 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)

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 expression for power flow in a co-axial cable. (16)

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

Or

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

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