KINGS

COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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UNIT I

PART –A

1. How the unit vectors are defined in cylindrical co- ordinate system?(2)

2. State stoke's theorem. (2)

3. State divergence theorem(2).

4. Under what condition will the electric field be both solenoidal & irrotational? (2)

5. Convert the point P(3,4,5)from cartesian to spherical co-ordinates(2)

6. Express the divergence of a vector in the three system of orthogonal co-ordination(2)

7. Transform a vector $A=YI_X-XI_Y+ZI_Z$ in to cylindrical co-ordinates. (2)

8. Write down the expression for differential length, volume & area in three co-Ordinate system(2)

9. Find the distance from a(1,2,3)to(2,0,-1)in rectangular co-ordinates(2)

10 . Explain the physical significance of ▼v. (2)

11. State coulombs lawof electric force. (2)

12. Find the force in Newton between two charges ,30μc and -30μcsituated at (0,1,2)m & (2,0.0)m, respectively in free space. (2)

13. Define electric field intensity. (2)

14. State gauss law. (2)

15. Determine the potential difference between the points a and b which are at a distance of 0.5m and 0.1m respectively from a negative charge of $20x10^{-10}$coulomb, ε_0=8.854picoF/m (2)

16. Define potential difference& absolute potential. (2)

17. State the conditions of gauss law. (2)

18. Write the expression for electric field intensity at any point due to infinite plane sheet having charge density σ_s c/m^2 (2)

19 . What are the equipotential surfaces? give two example. (2)

20. Why electric field inside a conductor is zero. (2)

21. Show by using gauss law:D= ε_0 E. (2)

22. Show that E=-▼V(2)

23. Define electric flux density(2)

24. Define electric scalar potential(2)

25. Define electric vector potential(2)

26. Define electric dipole moment. (2)

27. State any two applications of gauss law(2)

28. State principles of super position (2)

PART-B

1. The electric field in a spherical co-ordinate is given by E=rpr/5ε. Show that closed ∫E.dS=∫(▼.E)Dv. (12)

2. State and proof divergence theorem (8)

3. Check validity of the divergence theorem considering the field D=2xy ax $+x^2$ay c/m^2 and the rectangular parallelepiped formed by the planes x=0,x=1,y=0,y=2 &z=0,z=3. (12)

4 .A vector field D=[5r^2/4]Ir is given in spherical co-ordinates. Evaluate both sides of divergende theorem for the volume enclosed between r=1&r=2. (12)

5. Given A= 2r cosΦ+Riφ in cylindrical co-ordinates .for the contour x=0to1 y=0to1 , verify stoke's theorem (12)

6. Explain three co-ordinate system. (16)

7. What are the major source of electromagnetic fields (8)

8.. State and proof gauss law .and explain applications of gauss law. (16)

9. Drive an expression for the electric field due to a straight and infinite uniformly charged wire of length 'L' meters and with a charge density of +λ c/m at a point P which lies along the perpendicular bisector of wire. (12)

10. A uniform line charge ρ_L =25Nc/m lies on the x=3m and y=4m in free space . find the electric field intensity at a point (2,3,15)m. (8)

11. A circular disc of radius 'a' m is charged uniformly with a charge density of σ c/ m^2.find the electric field at a point 'h' m from the disc along its axis. (12)

12. A circular disc of 10 cm radius is charged uniformly with a total charge 10^{-10}c.find the electric field at a point 30 cm away from the disc along the axis. (8)

13. Define the potential difference and absolute potential. Give the relation between potential and field intensity. (12)

14. Given that potential V=10sinθcosΦ/r2 find the electric flux density D at (2,π/2,0) (8)

15 .Derive an expression for potential due to infinite uniformly charged line and also derive potential due to electric dipole. (16)

16. State and proof electric scalar potential and also derive relationship between potential and electric field (12)

UNIT II

PART-A

1. Define Lorentz law of force. (2)

2. Define Magnetic Field Intensity. (2)

3. State Biot-savart Law. (2)

4. State Ampere's scircuital law. (2)

5. Define Scalar Magnetic potential and vector magnetic potential. (2)

6. Define Magnetic Moment. (2)

7. Define Magnetisation(2)

8. What is the Magnetic field B infinite long wire carrying a current I. (2)
9. Write equation for torque acting on the rectangular loop(2)

10. State any two applications of Lorentz force(2)

11. Define magnetic vector potential. (2)

PART-B

1. Derive the expression for magnetic field intensity magnetic flux density due to finite and infinite line (12)

2. Derive the expressions for magnetic field intensity and magnetic flux density due to circular coil. (12)

6. Derive an expressions for force between two current carrying conductors (6)

7. An iron ring with a cross sectional area of 3cm square and mean circumference of 15 cm is wound with 250 turns wire carrying a current of 0.3A.The relative permeability of ring is 1500.calculate the flux established in the ring. (8)

8. Explain Magnetic materials and scalar and vector magnetic potentials. (12)

10. Derive the expression for torque developed in a rectangular closed circuit carrying current I a uniform field. (8)

11. A solenoid 25cm long ,1cm mean diameter of the coil turns a uniformly

distributed windings of 2000turns .the solenoid is placed in uniform field of 2 tesla flux density. a current of 5a is passed through the winding. determine the
(i)maximum torque on the solenoid&
(ii)maximum force on the solenoid
(iii)compute the magnetic moment on the solenoid. (8)

12.State ampere's circuital law and explain any two applications of ampere's circuital law. (12)

UNIT III

PART –A

1. Write down the expression for laplace's &poisson's equations. (2)

2. What is electric polarization? (2)

3. Determine the capacitance of the parallel plate capacitor composed of tin foil sheets,25cm square for plates separated through a glass dielectric0.5cm thick with relative pemittivity 6(2)

4. Define dielectric strengh. (2)

5. Write the expression for capacitance of an isolated sphere. (2)

6. Write the expression for energy density in electric field. (2)

7. Write the expression for capacitance of co-axial cable. (2)

8. Write the expression for capacitance of concentric spheres. (2)

9. define magnetization and permeability(2)

10.define current density(2)

11.define capacitance(2)

12.define self inductance and mutual inductance. (2)

13.what are the magnetic materials. (2)

14.define boundary conditions(2)

15 .write expression of an energy stored and energy density in magnetic materials(2)

16. write expression of an energy stored and energy density in electric materials(2)

17. write the expression for inductance toroid coil. (2)

18. write the expression for inductance solenoid (2)

19. Define point form of ohm's law. (2)

20. Calculate the inductance of a ring shaped coil having a mean diameter of 20 cm wound on a wooden core of 2 cm diameter .The winding is uniformly distributed and contains 200 turns. (2)

21. Define coefficient of coupling(2)

PART-B

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1. Derive the boundary conditions of the normal and tangential components of electric field at the inter face of two media with different dielectrics. (12)

2. Derive an expression for the capacitance of a parallel plate capacitor having two dielectric media. (8)

3. Obtain the expression for the energy stored in magnetic field (8)

4. Drive an expression for energy stored and energy density in an electrostatic field. (10)

5. Derive an expression for the capacitance of two wire transmission line. (8)

6. Derive an expression for capacitance of concentric spheres. (8)

7. Derive an expression for capacitance of co-axial cable. (8)

8 .Explain and derive the polarization of a dielectric materials. (8)

9. List out the properties of dielectric materials. (8)

10. The capacitance of the conductor formed by the two parallel metal sheets, each 100cm2,in area separated by a dielectric 2mm thick is , $2x10^{-10}$ micro farad .a potential of 20kv is applied to it .find
(i)electric flux
(ii)potential gradient in kV/m
(iii)the relative permittivity of materials
(iv)electric flux density. (8)

11. Derive an expression for series and parallel plate capacitor. (8)

12. Derive the boundary conditions of the normal and tangential components of magnetic field at the inter face of two media with different dielectrics. (12)

11. A solenoid 25cm long ,1cm mean diameter of the coil turns a uniformly distributed windings of 2000turns .the solenoid is placed in uniform field of 2tesla flux density. a current of 5a is passed through the winding. determine the
(i)maximum torque on the solenoid&
(ii)maximum force on the solenoid
(iii)compute the magnetic moment on the solenoid. (8)

12. Derive an expression for co-efficient of coupling. (10)

13.Proof laplace's and poission 's equation (6)

14.Derive an expression for inductance of loops and solenoid (10)

UNIT IV

PART-A

1. State faradays law of electromagnetic induction. (2)

2.What is displacement current .differentiate conduction current and displacement current. (2)

3.Define lenz's law. (2)

4.Write the point form and integral form of maxwell's equation using faradays law(2)

5.Write the point form and integral form of maxwell's equation using ampere circuital law(2)

6.Write the point form and integral form of maxwell's equation using electric and magnetic gauss law(2)

7. Define pointing vector. (2)

8.Define Instantaneous average vector (2)

9.Define complex pointing vector(2)

PART-B

3. With necessary explanation, derive the maxwell's equation in differential and integral forms (16)
4. Write short notes on faradays law of electromagnetic induction. (8)

5. What do you mean by displacement current? write down the expression for the total current density (8)

6.In a material for which σ=5 s/m and ε_r=1 and E=250 sin 10^{10}t (V/m).find the conduction and displacement current densities. (8)

7.Find the total current in a circular conductor of radius 4mm if the current density Varies according to$J=10^4/R$ A/m^2 . (8)

8. The magnetic field intensity in free space is given as H=H0sinθ ay t A/m. where θ=ωt-βz and β is a constant quantity. Determine the displacement current density. (8)

9. What are the physical significance of the poynting vector? (6)

10. State and explain the pointing theorem (12)

UNIT V

PART-A

1. How a dielectric medium can be identified as lossless and lossy for a given Frequency? (2)

2. When E and H are polarized in x and –z directions respectively ,give the direction of the electro magnetic wane propagation. (2)

3. What do you mean by depth of penetration? (2)

4. For a lossy dielectric materials having μr=1, εr=48,σ=20 s/m .calculate the propagation constant at a frequency of 16GHZ. (2)

5. find the velocity of a plain wave in a loss-less medium having a relative permittivity of 5 and relative permeability of unity. (2)

6. In a time varying field situation how do you define a good conductor and a lossy dielectric materials? (2)

7. Define skin depth. (2)

8. Write boundary conditions on a perfect conductor surface. (2)

9. What is the significance of intrinsic impedance of free space? What is its value? (2)

10. Brief about the intrinsic impedance for a perfect dielectric medium. (2)

11. What is mean by linear polarization? (2)

12. What is brewster angle? (2)

13. What are the conditions to be satisfied for a linearly polarized uniform plane wave? (2)

14. State the significance of E and H .give an example of this. (2)

15. Write an expression for ‘loss tangent’ In an insulating materials and mention the practical significance of the same. (2)

16. A medium has constant conductivity of 0.1mho/m,μr=1,ε_r=30.when these parameters do not change with the frequency, check whether the medium behaves like a conductor or a dielectric at 50kHZ and 10GHZ. (2)

17. In free space E(z,t)100sin(wt-βz)a_x(V/m).find the total power passing through a square area of side 25mm ,in the z=0 plane. (2)

18. given E(z,t) 100sin(wt-βz)a_y(V/m).in free space ,sketch E and H at t=0. (2)

20. Find the average power loss/volume for a dielectric having ε_r=2.tanδ=0.0005, If E=1kV/m at 500MHz. (2)

PART-B

1. A plane wave propagating through a medium with ε_r=8,μr=2 has E=0.5 sin (10^8t-βz)az v/m.determine
   (i) β
   (ii) the loss tangent
   (iii) wane impedance
   (iv) wave velocity
   (v) magnetic field (10)

2. Derive an wave equation for non dissipative medium making use of Maxwell equations and field vectors E and H. (10)

3. A plane sinusoidal electromagnetic wave traveling in space has E_{max}=150μV/m.
   (i)Find the accompanying H_{max}
   (ii)Propagation is in X direction and H is oriented in Y direction. What is the direction of E.
   (iii) Compute the average power transmitted. (8)

4. Define wave. Derive the free space electromagnetic wave equation. (12)

5. Calculate the attenuation constant and phase constant for the uniform plane wave with the frequency of 10GHz in a medium for which μ=μ_0, ε_r=2.3 and σ=2.54x10^-4Ω/m (8)

6. Derive the expression for the attenuation constant ,phase constant and intrinsic impedance for a uniform plane wave in a good conductor. (8)

7.Discuss about the plane waves in lossy dielectrics. (16)

8.. Discuss about the plane waves in lossless dielectrics. (10)

9. Briefly explain about the wave incident
(i)normally on perfect conductor
(ii)obliquely to the surface of perfect conductor. (12)

10. Briefly explain about the wave incident
(i)normally on perfect dielectrics
(ii)obliquely to the surface of perfect dielectrics. (16)

11. Assume that Eand H waves ,traveeling in free space, are normally incident on the interface with a perfect dielectric with ε_r=3 .calculate the magnitudes of incident, reflected and transmitted E and H waves at the interface. (8)

12. A uniform plane wave of 200Mhz ,traveling in free space impinges normally on a large block of material having ε_r =4 , μ_r =9 and σ =0. calculate transmission and reflection co efficient of interface. (8)