Department of Electronics and Communication Engineering
18ECC150T – Electromagnetics and Transmission Lines
Question Bank

Part A

1. State divergence theorem.
2. State Stoke's theorem.
3. What is del operator? How is it used in density curl, gradient and divergence?
4. A = x ax + y ay+ y az
5. Define vector product of two vectors.
6. Write down expression for x, y, z in terms of spherical co-ordinates r,θ and φ.
7. Write down the expression for differential volume element in terms of spherical
8. co-ordinates.
9. What is the divergence of curl of a vector?
10. Write expression for differential length in cylindrical and spherical co-ordinates.
11. Find the divergence of F= x y ax+ y x ay + z x az
12. Define a vector and its value in Cartesian co-ordinate axis.
13. Verify that the vectors A= 4 ax - 2ay + 2az and B = -6ax + 3ay - 3az are parallel to each other.
14. List out the sources of electromagnetic fields.
15. When a vector field is solenoidal and irrotational?
16. State coulomb's law.
17. State Gauss's law.
18. Define dipole moment.
19. Define electric flux and flux density.
20. Define electric field intensity or electric field.
21. What is a point charge?
22. Write the Poisson's and Laplace equation.
23. Define potential and potential difference.
24. Give the relationship between potential gradient and electric field.
25. Define current density.
26. State point form of Ohm's law.
27. Define polarization.
28. Express the value of capacitance for a coaxial cable.
29. What is meant by displacement current?
30. State the boundary conditions at the interface between two perfect dielectrics.
31. Write down the expression for the capacitance between (a) two parallel plates (b) two coaxial cylinders.
32. Calculate the capacitance of a parallel plate capacitor having an electrode area of 100 cm2. The distance between the electrodes is 3 mm and the dielectric used has a permittivity of 3.6 the applied potential is 80 V. Also compute the charge on the plates.
33. An infinite line charge charged uniformly with a line charge density of 20 n C/m is located along z-axis. Find E at (6, 8, 3) m.
34. State Ampere's circuital law.
35. State Biot-Savart law.

36. State Lorenz law of force.
37. Define magnetic scalar potential.
38. Write down the equation for general, Integral and point form of Ampere's law.
39. What is field due to toroid and solenoid?
40. Define magnetic flux density.
41. Write down the magnetic boundary conditions.
42. Give the force on a current element.
43. Define magnetic moment.
44. Give torque on a solenoid.
45. State Gauss's law for magnetic field.
46. Define magnetic dipole.
47. Define magnetization.
48. Define – Characteristic Impedance
49. State the line parameters of a transmission line.
50. What are the secondary constants of a line?
51. What is an infinite line
52. Define – Propagation Constant
53. How does frequency distortion occur in a line?
54. What is an equalizer in transmission line?
55. What is delay distortion
56. What is a distortion less line?
57. What is the condition for a distortion less line?
58. What is a finite line and state its significance?
59. What is meant by the wavelength of a line?
60. What is meant by line distortion?
61. What are the different types of line distortions?
62. How is the frequency distortion avoided in a transmission line?
63. How is distortion avoided in a telephone line?
64. What is loading?
65. What are the different types of loading
66. What is continuous loading?
67. What is patch loading?
68. What is lumped loading?
69. What is the purpose of impedance matching
70. When does reflection occur in a line?
71. What are the conditions for a perfect line?
72. What is a smooth line?
73. What is dissipation less line?
74. What are the assumptions for the analysis of radio frequency line?
75. What is the nature and value of Z0 for the dissipation less line
76. What are nodes and antinodes on a line?
77. Define – Standing Wave Ratio
78. What is the relationship between standing wave ratio and reflection coefficient
79. Define – Reflection
80. Define – Reflection Loss
81. Define – Insertion Loss
82. What is the use of an eighth wave line?
83. Why is a quarter wave line called an impedance inverter?
84. What is the significance of a half wavelength line?
85. List the applications of the smith chart

86. Why is double stub matching preferred over single stub matching?
87. When does standing wave occur in a transmission line?
88. What is the input impendence of an eighth wave line terminated in a pure resistance RR?
89. What is an impedance matching in stub?
90. State reasons for preferring a short– circuited stub over an open circuited stub
91. What are the two independent measurements that must be made to find the location and length of the stub?
92. What is called double stub matching?
93. Why an open line is not frequently employed for impedance matching?
94. State the faraday's law.
95. State the faraday's law for the moving charge in a constant magnetic field.
96. State lenz's law.
97. Define displacement current density.
98. What are electric field and the power flow in the co-axial cable?
99. Define reluctance.
100. Write the maxwell's equation from ampere's law both in integral and point forms.
101. Write down the maxwell's equation from electric gauss's law in integral and point forms.
102. Write the maxwell's equation from faraday's law both in integral and point forms.
103. Write down the maxwell's equation from magnetic gauss's law in integral and point form.
104. Write the maxwell's equations from Gauss's law in integral form.
105. Write to maxwell's equations in integral form.
106. Write down the maxwell's equations from Gauss's law in point form. www.Vidyarthiplus.com www.Vidyarthiplus.com
107. Write down the maxwell's equation in point from.
108. Write down the maxwell's equation in point phasor forms.
109. Write down the maxwell's equation for free space in integral form.

Part B

1. Write short notes on the following: (a) Gradient (b) Divergence (c)Curl (d) Stoke theorem.
2. Explain the different coordinate systems.
3. State and explain Ampere's circuit law
4. a) State and explain Bio-savarts law.
   b)Derive an expression for the force between two long straight parallel current carrying conductors.
5. Show by means of Biot Savarts law that the flux density produced by an infinitely long straight wire carrying a current I at any point distant a normal to the wire.
6. For a finite current sheet of uniform current density 'k' A/m, Derive the expression for the magnetic field intensity.
7. Derive Biot Savart's law and ampere law using the concept of magnetic vector potential.

8. i) Derive the expression for the magnetic field intensity inside and outside a co-axial conductor of inner radius ‘a’ and outer radius ‘b’ and carrying a current of I amperes in the inner and outer conductor.
   ii) Calculate the self-inductance of infinitely long solenoid.
9. Derive the expression for the magnetic vector potential in the cases of an infinitely long straight conductor in free space.
10. (i)State and explain Faraday’s law.
    (ii)Compare the field theory and circuit theory.
11. Derive the Maxwell’s equation for free space in integral and point forms explain.
12. Derive Maxwell’s equation from Faraday’s law and Gauss’s law and explain them.
13. Derive the Maxwell’s equation in phasor differential form.
14. Derive the Maxwell’s equation in phasor integral form.
15. Derive and explain the Maxwell’s equations in point form and integral form using Ampere’s circuital law and Faraday’s law.
16. Calculate the following, 1) Attenuation constant 2) Phase constant 3) Propagation constant 4) Intrinsic impedance 5) Wave length 6) Velocity of propagation
17. Explain the wave propagation in good dielectrics with necessary equations.
18. Derive the conditions for minimum attenuation in the distortion less transmission line.
19. Explain in detail about the reflection on a line not terminated in its characteristic impedance Zo
20. Derive the transmission line equation and hence obtain the expression for voltage and Current on a transmission line
21. Prove that an infinite line equal to finite line terminated in its characteristic impedance
22. A communication link has R = 10.4 ohm/km, L = 3.67 mH/km, G = 0.08 μmho/km and C = 0.0083μF/km. Determine the characteristic impedance, propagation constant, phase constant, velocity of propagation, sending end current and receiving end current for given frequency f = 1kHz, sending end voltage is 1 volts and transmission line length is 100km.
23. Derive the expressions for input impedance of open&short circuited lines.
24. A telephone cable 64 km long has a resistance of 13 ohms/km and a capacitance of 0.008 micro farad/km. Calculate attenuation constant, velocity and wavelength of the line at 1000 HZ.
25. A 2 meter long transmission line with characteristic impedance of 60 + j40 ohm is operating at rad= ω10 /sec 6 has attenuation constant of zero neper/m. If the line is terminated by a load of 20+j50ohms, determine the input impedance of this line.
26. Discuss the characteristics of TE and TM waves and also derive the cut-off frequency and phase velocity from the propagation constant.
27. Derive the expressions for the field components of TM and TE waves in rectangular waveguides
28. Derive the wave impedance for TM and TE waves between parallel planes.
29. Derive the expressions for the field components of TM and TE waves between parallel plates, propagating in Z direction.