

Register No:

Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FOURTH SEMESTER B.TECH DEGREE EXAMINATION(R,S), MAY 2024**Electrical and Electronics Engineering****(2020 SCHEME)****Course Code : 20EET204****Course Name : Electromagnetic Theory****Max. Marks : 100****Duration:3 Hours****Scientific calculator is allowed in the examination hall.****PART A***(Answer all questions. Each question carries 3 marks)*

1. Evaluate the gradient of the field $(3z \cos \Phi)/\rho$. Comment on the nature of this field.
2. If the fields M and N are respectively are of vector and scalar in nature. What is the curl of a gradient of N? What is the divergence of curl of a M?
3. Define equipotential surfaces and give two examples for it.
4. Define Gaussian surface. List any 3 properties of Gaussian surfaces.
5. Write the expression for the tangential and normal components of electric field intensity and electric flux density for a boundary condition that is employed as electrostatic screening or shielding.
6. Define linear media. Comment on the directions of current density and electric field intensity for a material having the properties of a linear media.
7. Calculate the velocity of a plane wave in a lossless medium having relative permittivity of 5.
8. Distinguish between phase and group velocity.
9. Define a) intrinsic impedance b) characteristic impedance.
10. List the electrical parameters of a transmission line.

PART B*(Answer one full question from each module, each question carries 14 marks)***MODULE I**

11. A vector field is specified as $G = 24xy a_x + 12(x^2 + 2) a_y + 18z^2 a_z$. For two given points $P (1, 2, -1)$ and $Q (-2, 1, 3)$, find:

(a) G at P	3
(b) a unit vector in the direction of G at Q	4
(c) a unit vector directed from Q to P	3
(d) angle between position vectors OP and OQ	4

OR

12. Explain the cylindrical coordinate system. With neat diagram derive the expression for differential volume in cylindrical coordinate system.

MODULE II

13. (a) What is the difference between electric field and electric field intensity. Derive the expression for electric field intensity due to a point charge. Write the mathematical expression for the electric field intensity due to all the forms of charge densities 7
 (b) Two point charges 20 nC and - 20 nC are situated at $(1, 0, 0)$ and $(0, 1, 0)$ in vacuum. Determine the electric field intensity at $(0, 0, 1)$ and $(0, 0, 0)$. Sketch the electric field due to this system. 7

OR

14. (a) Define capacitance and derive the expression for the capacitance of a parallel plate capacitor with appropriate diagrams. 7
 (b) Derive the expression for the capacitance of a coaxial cable having length ' l ', inner and outer radii ' a ', and ' b ' respectively. 7

MODULE III

15. State and explain Biot Savarts Law. Employing the same derive the expression for the magnetic field intensity due an conductor of infinite length carrying a time invariant current. 14

OR

16. Derive the integral and differential forms of all four Maxwell's equations. 14

MODULE IV

17. a) A 9500MHz uniform plane wave is propagating in polystyrene. If the amplitude of electric field intensity is 30 V/m and the material is assumed to be lossless. Calculate i) phase constant, ii) wavelength, iii) velocity of propagation, iv) propagation constant, v) amplitude of magnetic field intensity. 10
 b) Explain the physical significance of Poynting vector. 4

OR

18. a) When the amplitude of the magnetic field in a plane wave is 2 A/m, i)determine the magnitude of the electric field for the plane wave in free space, ii)determine the magnitude of the electric field when the wave propagates in a medium which is characterised by $\sigma = 0, \mu = \mu_0, \epsilon = 4\epsilon_0$. 7
 b) Derive the wave equation in free space. 7

MODULE V

19. a) Explain voltage standing wave ratio. 4
 b) A lossless transmission line with $Z_0=50\Omega$ is 30 m long and operates at 2 MHz.The line is terminated with a load $Z_L=60+j40 \Omega$.find 1. Reflection coefficient 2. voltage standing wave ratio. 10

OR

20. Explain about Electromagnetic Interference and Electromagnetic compatibility. 14
