Code: 20A04401

R20

B.Tech II Year II Semester (R20) Regular & Supplementary Examinations April/May 2024

EM WAVES AND TRANSMISSION LINES

(Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Write about Spherical Coordinates. 2M

(b) Write about Divergence Theorem. 2M

(c) List the Biot-Savart's Law for all types of current distributions. 2M

(d) Define magnetic flux density and explain its significance. 2M

(e) State the boundary conditions for electromagnetic fields at a dielectric-dielectric interface. 2M

(f) List the key relations between the electric field (E) and magnetic field (H) in uniform plane waves. 2M

(g) What is Brewster angle? 2M

(h) What is Critical angle? 2M

(i) A low loss transmission line of 100 Ω characteristics impedance is connected to a load of 200 Ω. Compute the voltage reflection coefficient. 2M

(j) A 50Ω lossless transmission line is terminated on a load impedance of Z_L = (25 + j 50) Ω. Find VSWR. 2M

PART – B

(Answer all the questions: 05 X 10 = 50 Marks)

2 (a) Define Coulomb's law and derive the force F that exists between two unlike charges. 5M

(b) Two-point charges, Q_A = +8 μC and Q_B = -5 μC, are separated by a distance r = 10 cm. What is the magnitude of the electric force between them? 5M

OR

3 (a) Apply Gauss Law to evaluate the electric flux density at a point P due to the point charge located at the origin. 5M

(b) Define Electric Potential. Find the electric potential for a point charge is located at origin and Write Maxwell's second equation for electrostatic field. 5M

4 (a) Explain Biot-Savart's Law. 5M

(b) Find the Magnetic field Intensity due to a Straight current carrying filamentary conductor of finite length. 5M

OR

5 (a) Determine the Magnetic Field Intensity due to a infinite sheet current. 5M

(b) Explain about Inconsistency of Ampere's Law. 5M

6 Explain the boundary conditions for electromagnetic fields at the interface between two dielectric materials. 10M

OR

7 Explain about Wave Propagation in good conductors and good dielectrics. 10M

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8	Evaluate the expressions for reflection coefficient and transmission coefficient by a normal incident wave for a dielectric medium.	10M
	OR	
9	Explain the following : (i) Poynting Theorem. (ii) Power loss in a Plane Conductor.	10M
10	With neat sketch explain about Primary and Secondary constants of transmission line.	10M
	OR	
11	Explain about Single and Double Stub Matching.	10M

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B.Tech II Year II Semester (R20) Regular & Supplementary Examinations August/September 2023

EM WAVES AND TRANSMISSION LINES

(Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Given a vector function $F = a_x(3y - c_1z) + a_y(c_2x - 2z) - a_z(c_3y + z)$, Determine the constants c_1, c_2 and c_3 if 'F' is irrotational. 2M

(b) State Gauss law. 2M

(c) What is the basis for Magnetic Scalar Potential? 2M

(d) Write the integral form of Maxwell's equations. 2M

(e) What is a boundary condition? How do boundary conditions arise and how are they derived? 2M

(f) Most microwave ovens operate at 2.45 GHz. Assume $\sigma = 1.1X10^6$ Ʊ/m and $\mu_r = 600$ for the stainless steel interior and find the depth of penetration. 2M

(g) What is the Poynting Vector? What is the physical interpretation of the Poynting Vector over a closed surface? 2M

(h) Define Brewster angle. 2M

(i) Draw the Voltage and Current variation along an Open circuited and a Short circuited line. 2M

(j) Draw an Equivalent Circuit of Two Wire Transmission Line. 2M

PART – B

(Answer all the questions: 05 X 10 = 50 Marks)

2 Point charges Q_1 and Q_2 are respectively located at (4, 0, -3) and (2, 0, 1). If $Q_2 = 4nc$, Find Q_1 such that (i) the E at (5, 0, 6) has no Z-Component, (ii) the force on a Test charge at (5, 0, 6) has no X-Component. 10M

OR

3 Determine the Electric field intensity of an infinitely long straight, line charge of uniform density ρ_L in air. 10M

4 Explain the nature of line, surface and volume current distributions as applicable to static magnetic fields. List out the expressions for the magnetic field intensity in these three cases. 10M

OR

5 Find the magnetic field intensity at the center of a square loop, with side 'w' Carrying a direct current 'I'. 10M

6 From the Maxwell's curl's equation derive the wave equations for an Electromagnetic wave in conducting media. 10M

OR

7 Write short notes on EM wave Polarization. 10M

8 Discuss the determination of the reflected and wave fields of a uniform plane wave incident normally onto a plane boundary between two material media. 10M

OR

9 State and prove Poynting Theorem. 10M

10 Show that a Transmission line will be distortion less if LG = RC. 10M

OR

11 Define input impedance of a transmission line. Derive an expression for input impedance of a transmission line in terms of reflection co-efficient. 10M

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