Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree Regular and Supplementary Examination July 2021

Course Code: EE302
Course Name: ELECTROMAGNETICS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks. Marks

1 State Stoke's theorem and explain its significance. (5)

2 The region between two concentric right circular cylinders contains a uniform volume charge density ρ. Solve the Poisson's equation for the potential in the region. (5)

3 State Ampere's circuital law and using it derive the expression for magnetic field intensity around an infinitely long straight current carrying conductor (5)

4 What is electric polarization? How dielectrics are classified based on polarization? (5)

5 Using Poynting Theorem derive an expression for power flow in a co-axial cable (5)

6 What are uniform plane waves? Explain. (5)

7 Explain phase velocity and group velocity. (5)

8 What is skin depth? Explain. (5)

PART B

Answer any two full questions, each carries 10 marks.

9 Verify divergence theorem for the vector field **D**=$2\rho z^2 a_\rho + \rho cos^2\Phi a_z$ over the region defined by $0 \le \rho \le 5$, $-1 \le z \le 1$ and $0 \le \Phi \le 2\pi$. (10)

10 a) State and prove Gauss's Law. (4)

b) A circular ring of radius a carries a uniform charge ρ_L C/m and is placed on the xy-plane and centerd at origin. Derive an expression for electric field intensity at a point (0, 0, h) on the axis of the ring. (6)

11 a) Explain the physical significance of gradient of a scalar quantity and curl of a vector quantity. (5)

b) What is an equipotential surface? What are its properties? (5)

PART C

Answer any two full questions, each carries 10 marks.

12		State and explain Biot-Savart Law. Apply Biot-Savart's Law to derive an expression for magnetic field intensity due to a straight current carrying conductor of finite length.	(10)
13	a)	Apply amperes circuital law to find magnetic field intensity due to an infinitely long straight conductor.	(5)
	b)	From Faraday's Law, derive Maxwell's Equations in Differential and integral form.	(5)
14		Derive an expression for electrostatic energy in terms of electric field intensity.	(10)

PART D

Answer any two full questions, each carries 10 marks.

15		From Maxwell's equations, derive wave equations for free space. Also write wave equations in phasor form.	(10)
16	a)	Explain about electromagnetic interference and electromagnetic compatibility.	(5)
	b)	A uniform plane wave in free space is given by **E**=10.4× $10^{-6}e^{j(2\pi\times10^{9}t-\beta x)}a_y$V/m. Find (i) Direction of propagation (ii) wave velocity (iii) Phase constant β	(5)
17		For a lossy dielectric material having $\mu_r = 1, \varepsilon_r = 48, \sigma = 20\Omega^{-1}m^{-1}$. At a frequency of 16 GHz, calculate the (i) propagation constant (ii) attenuation constant (iii) phase constant and (iv) wavelength	(10)

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