Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SIXTH SEMESTER B. TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: EE302

Course Name: ELECTROMAGNETICS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries5 marks. Marks

1 Explain the physical significance of Divergence of a vector field. (5)

2 Two-point charges of 20nC and -20nC are located at (1,0,0) and (0,1,0) respectively in free space. Calculate the electric field intensity at (0,0,1). (5)

3 State and prove Ampere's Circuital law. (5)

4 Explain Electric Polarization. (5)

5 What is meant by uniform plane waves? Also, why are electromagnetic waves called as transverse electromagnetic waves? (5)

6 Explain Poynting vector and Poynting theorem. (5)

7 Explain skin depth and obtain an expression for it. (5)

8 Explain characteristic impedance and standing wave ratio of transmission line. (5)

PART B

Answer any two full questions, each carries10 marks.

9 Verify divergence theorem for the vector field $\bar{H} = 2\rho Z^2 \overline{a_\rho} + \rho cos^2 \emptyset \overline{a_Z}$ over the surface defined by $\rho = 2,\ 0 < Z < 2,\ 0 \leq \emptyset \leq 2\pi$. (10)

10 a) A vector field $\bar{E} = \frac{100\cos\theta}{\rho^3}\overline{a_\rho} + \frac{50\sin\theta}{\rho^3}\overline{a_\theta}$ at a point with spherical coordinates $(2, \frac{\pi}{3}, \frac{\pi}{9})$. Find (i) Magnitude of $\bar{E}$ (ii) Unit vector in cartesian coordinate in the direction of $\bar{E}$. (6)

b) Explain Equipotential surface. (4)

11 a) Derive the expression of Electric field intensity due to infinite line charge having line charge density ρ_L C/m. (6)

b) Derive Laplace's equation for electrostatic field. (4)

PART C

Answer any two full questions, each carries10 marks.

12 Derive Maxwell's equations in integral form and point form. (10)

13 a) A circular loop of radius 'a' m is carrying a current of I A. Find the magnetic (6)

field intensity at a point 'h' m from the loop along its axis.

b) Explain magnetic scalar and vector potential. (4)

14 a) Derive Continuity equation. (3)

b) Explain displacement current density. Obtain the dielectric-dielectric boundary conditions for electric fields. (7)

PART D

Answer any two full questions, each carries 10 marks.

15 Derive wave equation from Maxwell's equation for a plane wave in a perfect dielectric. (10)

16 Explain power flow in a co-axial cable using poynting theorem. (10)

17 a) Explain very briefly about Electromagnetic Interference and Electromagnetic compatibility. (2)

b) A 180 MHz plane wave is travelling in a medium characterized by $\mu_r = 1$, $\varepsilon_r = 25, and\ \sigma = 2.5\frac{mS}{m}$. Find (i) intrinsic impedance (ii) Attenuation constant (iii) Propagation constant (iv) Skin depth. (8)

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