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 carries 5 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 carries 10 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 carries 10 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   (7)
conditions for electric fields.

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   (10)
dielectric.

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

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

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

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