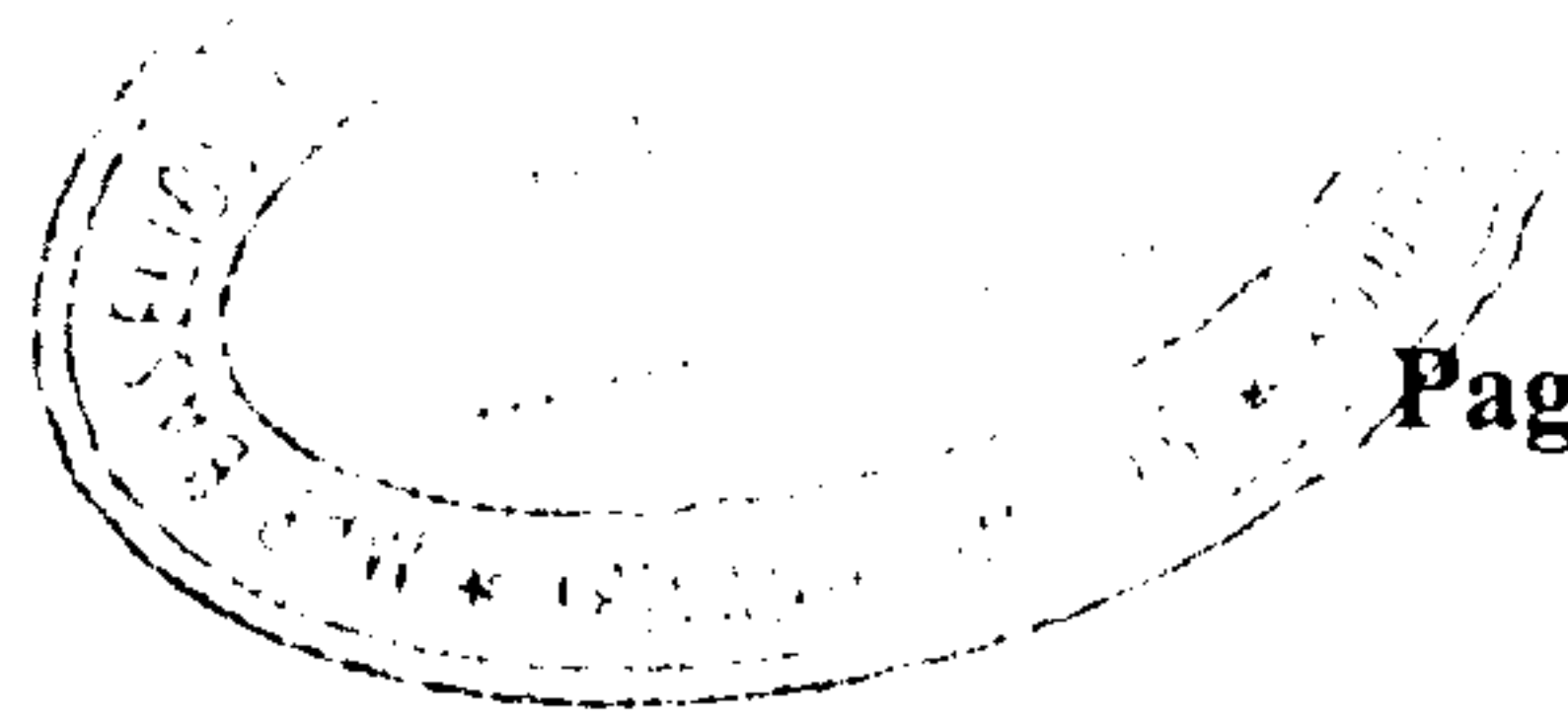




Reg No.: _____

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.

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|-------|--|------|
| 9 | Verify divergence theorem for the vector field $\vec{H} = 2\rho Z^2 \vec{a}_\rho + \rho \cos^2 \phi \vec{a}_z$ over the surface defined by $\rho = 2$, $0 < Z < 2$, $0 \leq \phi \leq 2\pi$. | (10) |
| 10 a) | A vector field $\vec{E} = \frac{100 \cos \theta}{\rho^3} \vec{a}_\rho + \frac{50 \sin \theta}{\rho^3} \vec{a}_\theta$ at a point with spherical coordinates $(2, \frac{\pi}{3}, \frac{\pi}{9})$. Find (i) Magnitude of $\vec{E}$ (ii) Unit vector in cartesian coordinate in the direction of $\vec{E}$. | (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.

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|-------|---|------|
| 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 $\mu_r = 1$, $\epsilon_r = 25$, and $\sigma = 2.5 \frac{mS}{m}$. Find (i) intrinsic impedance (ii) Attenuation constant (iii) Propagation constant (iv) Skin depth. (8)

