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   (10)
the surface defined by $\rho = 2,\ 0 < Z < 2,\ 0 \le \emptyset \le 2\pi$.

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   (6)
coordinates $(2,\frac{\pi}{3},\frac{\pi}{9})$. Find (i) Magnitude of $\bar{E}$ (ii) Unit vector in cartesian
coordinate in the direction of $\bar{E}$.

   b) Explain Equipotential surface.   (4)

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

   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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