Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree S6 (S, FE) / S4 (PT) (S, FE) Examination January 2024 (2015 Scheme)

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	Derive Laplace equation for electrostatic field	(5)
3	State and explain Ampere's circuital law	(5)
4	Explain the electrostatic boundary conditions at a dielectric-dielectric boundary	(5)
5	What is meant by a uniform plane wave?	(5)
6	Define propagation constant for uniform plane wave propagation	(5)
7	Define phase velocity and group velocity.	(5)
8	What is electromagnetic interference? What are its causes?	(5)

PART B
Answer any two full questions, each carries 10 marks.

9   a)   Express the vector $B = \frac{10}{r}a_r + rcos\theta a_\theta + a_\varphi$ in cartesian coordinates.   (6)

       Find **B** at (-3,4,0).

    b)   State Stoke's theorem. Mention one application.   (4)

10   a)   A charge Q_1=-20µC is located at P(-6,4,6) and a charge Q_2=50µC is located at   (6)
R(5,8,-2) in free space. Find the force exerted on Q2 by Q_1 in vector form. The
distance is given in meters.

    b)   Explain the concept of electric potential and potential gradient.   (4)

11   a)   Apply Gauss's law to find the expression for electric field intensity and electric   (5)
flux density due to an infinitely long line charge distribution

    b)   Determine divergence of the following vector fields: (5)

      i. $P = x^2yza_x + xya_z$

      ii. $Q = \rho sin\varphi a_\rho + \rho^2 z a_\varphi + z cos\varphi a_z$

PART C
Answer any two full questions, each carries 10 marks.

12 a) Apply Amperes circuital law to find the magnetic field intensity due to an infinitely long straight conductor   (6)

b) Explain magnetic scalar and vector potential   (4)

13 a) Derive continuity equation for current.   (5)

b) A current filament carries a current of 10A in the a_z direction on the z axis. Find the magnetic field intensity **H** at point P(1,2,3) due to this filament, if it extends from z=0 to 5.   (5)

14 a) Derive Maxwell's equation in integral form and differential form from.   10

PART D
Answer any two full questions, each carries 10 marks.

15 a) State and prove Poynting's theorem and explain the physical significance of Poynting vector   (10)

16 a) Define Standing Wave Ratio. How is it related to Voltage reflection coefficient?   (5)

b) Derive the wave equation for electric field in phasor form   (5)

17 a) Derive wave equation for a long transmission line.   (10)

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