

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
Fourth Semester B.Tech Degree Examination July 2021 (2019 Scheme)

**Course Code: EET204**

**Course Name: ELECTROMAGNETIC THEORY**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*(Answer all questions; each question carries 3 marks)*

		Marks
1	Explain divergence of a vector field with its physical significance	3
2	Evaluate the gradient of the scalar field $\frac{3z}{\rho} \cos\phi$	3
3	Sketch equipotential surfaces for a positive test charge	3
4	Illustrate the conservative nature of electrostatic field	3
5	Using Ampere's circuital law, obtain the expression for magnetic field intensity due an infinite wire carrying current	3
6	What do you mean by magnetic vector potential	3
7	Explain the significance of Poynting vector	3
8	What is skin effect and explain its significance	3
9	List the reasons for Electromagnetic Interference	3
10	Explain impedance matching in transmission lines	3

**PART B**

*(Answer one full question from each module, each question carries 14 marks)*

**Module -1**

- 11 a) State and prove Stokes' theorem 7
- b) Evaluate the curl of the following vector fields a)  $\mathbf{P} = xy \mathbf{a}_x + y^2 \mathbf{a}_y + xz \mathbf{a}_z$  7
- b)  $\mathbf{Q} = \rho z^2 \mathbf{a}_\rho + \rho \sin^2\phi \mathbf{a}_\phi + 2\rho z \sin^2\phi \mathbf{a}_z$
- 12 a) Explain spherical to rectangular coordinate system transformation 7
- b) Express the vector  $\mathbf{A} = \rho \sin\phi \mathbf{a}_\rho + \rho \cos\phi \mathbf{a}_\phi - 2z \mathbf{a}_z$  in rectangular coordinates 7

**Module -2**

- 13 a) State and explain Gauss's law 7
- b) Using Gauss's law, determine the electric field intensity due to an infinite sheet charge of uniform surface charge density. 7

- 14 a) Derive the expression for capacitance of a coaxial cable 7  
b) Obtain Poisson's and Laplace's equations for a homogeneous material 7

**Module -3**

- 15 a) State and explain Biot Savart's law 7  
b) Obtain the expression for magnetic field intensity on the axis of a rectangular loop carrying current 7
- 16 a) Explain the boundary conditions for electric field in a dielectric-dielectric interface 7  
b) State and explain the continuity equation for current 7

**Module -4**

- 17 a) Derive wave equations from Maxwell's equations 7  
b) Explain propagation of uniform plane waves in a lossy dielectric medium 7
- 18 a) Define the following terms: phase velocity, group velocity, Attenuation constant and Propagation Constant 6  
b) State and explain Poynting theorem 8

**Module -5**

- 19 a) Obtain the transmission line equations and its solution 10  
b) State the transmission line parameters 4
- 20 a) Obtain the expression for propagation constant and characteristic impedance in the case of a lossless transmission line 7  
b) A low loss coaxial cable of characteristic impedance  $50 \Omega$  is terminated by a resistive load of  $150 \Omega$ . Calculate Voltage standing wave ratio. If the maximum voltage in SWR is 30V, find the minimum voltage 7

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