

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

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

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019

**Course Code: EE302**

**Course Name: ELECTROMAGNETICS**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer all questions, each carries 5 marks.*

Marks

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|---|--|-----|
| 1 | Find the divergence of $\bar{A}$ where $\bar{A} = \rho z \sin \phi \bar{a}_\rho + 3\rho z^2 \cos \phi \bar{a}_\phi$  | (5) |
| 2 | Define equipotential surface?  | (5) |
| 3 | Explain Biot-Savart Law.   | (5) |
| 4 | Derive Maxwell's equations in differential and integral form from Faraday's Law  | (5) |
| 5 | What is displacement current?  | (5) |
| 6 | Apply Poynting theorem to derive an expression for power flowing through a co-axial cable  | (5) |
| 7 | Compute the phase constant and attenuation constant for a uniform plane wave having frequency 10GHz in a lossy dielectric material for which $\mu = \mu_0$ , $\epsilon_r = 2.3$ and $\sigma = 2.56 \times 10^{-4} \text{ S/m}$ . | (5) |
| 8 | What is electromagnetic interference? What are its causes?   | (5) |

**PART B**

*Answer any two full questions, each carries 10 marks.*

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|----|--|-----|
| 9  | a) State and Prove Stoke's Theorem   | (5) |
|    | b) What is Curl of a vector field? Explain its physical significance.  | (5) |
| 10 | a) State and Prove Gauss's law.  | (5) |
|    | b) Apply Gauss's law to find the expression for Electric field Intensity and Electric flux density due an infinite line charge distribution. | (5) |
| 11 | a) Explain the concept of electric potential and potential gradient.   | (5) |
|    | b) Explain spherical co-ordinate system.   | (5) |

**PART C**

*Answer any two full questions, each carries 10 marks.*

- 12 a) Apply Biot-Savart law and determine an expression for magnetic field intensity (7)  
at a point due to an infinitely long straight conductor carrying current I.
- b) Explain continuity equation for current. (3)
- 13 a) State Ampere's circuital law and explain any one application of Ampere's (5)  
circuital law
- b) Derive the boundary conditions with respect to the electric field at the interface (5)  
of a dielectric – dielectric boundary
- 14 a) Derive an expression for energy stored in an electrostatic field in terms of (7)  
electric flux density.
- b) What is electric polarisation? Explain. (3)

**PART D**

*Answer any two full questions, each carries 10 marks.*

- 15 State and explain Poynting theorem and Poynting vector. Also derive an (10)  
expression for average power density.
- 16 a) A uniform plane wave is travelling at a velocity of  $2.5 \times 10^5$  m/s having (5)  
wavelength  $\lambda = 0.25$ mm in a non magnetic good conductor. Calculate the  
frequency of wave and the conductivity of a medium.
- b) What are electromagnetic waves? Explain the concept of uniform plane waves. (5)
- 17 Derive the wave equations for a transmission line. (10)

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