

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth semester B.Tech degree examinations (S) September 2020

Course Code: EC303**Course Name: APPLIED ELECTROMAGNETIC THEORY**

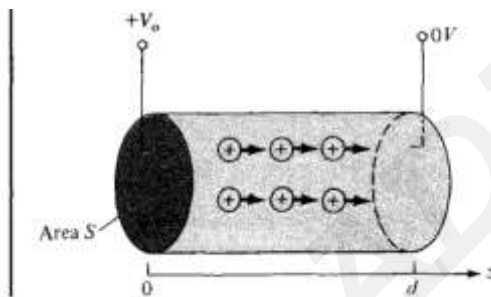
Max. Marks: 100

Duration: 3 Hours

PART A*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) State and explain Ampere's law and Coulomb's law (8)
- b) Consider a region between two electrodes separated by a distance, d , having a uniform charge density of ρ_v . Voltage on one electrode is V_0 and other electrode is 0 V . Find the expression of electric field in terms of V_0 , ρ_v and d . (7)



- 2 a) In a lossy dielectric medium, characteristic impedance of the medium is $173 + j100\ \Omega$, Expression of Magnetic field of a plane wave is given by $\vec{H} = 10 e^{-\alpha x} \cos(\omega t - 0.5x) \hat{a}_z\text{ A/m}$. Find (7)
- Direction of propagation
 - Loss tangent
 - Attenuation constant
 - Phase constant
 - Skin depth
- b) State and explain Skin Depth. For a good conductor, prove that $\alpha = \beta$, where, α is the attenuation constant and β is the phase constant. (8)
- 3 a) Derive continuity equation from fundamental laws. (8)
- b) Explain boundary conditions for Electric field and Magnetic field. (7)

PART B*Answer any two full questions, each carries 15 marks.*

- 4 a) Derive the expression for reflection coefficient for a wave of parallel (8)

polarization, travelling from one medium to another at oblique incidence.

- b) Explain wave polarization and different polarisation with example. (7)
- 5 a) A transmission line of length 0.2λ and characteristic impedance 100Ω is terminated with a load impedance of $50+200j$. Find input impedance, reflection coefficient at load end, reflection coefficient at the input end and VSWR. (8)
- b) Explain lossless transmission line and distortion less transmission line (7)
- 6 a) Derive the expression for Brewster angle for parallel polarised wave. (7)
- b) Derive the expression for propagation constant of transmission line. (8)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Derive the expression for r circles and x circles in Smith chart. (8)
- b) A $25 + j100 \Omega$ load is connected to a 50Ω lossless transmission line. Using smith chart, find (8)
- i. Reflection coefficient at load
 - ii. VSWR
 - iii. Load admittance
 - iv. Input impedance at 0.2λ from the load
 - v. Reflection coefficient at 0.2λ from the load
- c) Briefly explain importance of quarter wave transformer. (4)
- 8 a) Explain the propagation of electromagnetic wave in a rectangular waveguide (10)
- b) For TE_{10} mode of propagation in a rectangular wave guide, with length 8cm and 6 cm respectively, find the following when frequency of operation is 6 GHz. (10)
- i. Cut off frequency
 - ii. Cut off wavelength
 - iii. Guide wavelength
 - iv. Phase constant
 - v. Phase velocity
 - vi. Group velocity
 - vii. Wave impedance
- 9 a) Derive the expression all the Electric and magnetic field components for Transverse Magnetic Modes. (10)
- b) Explain single stub tuning method using Analytical method. (10)