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

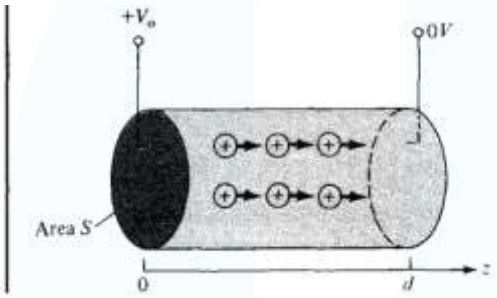
Max. Marks: 100 Duration: 3 Hours

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 Ω , Expression of Magnetic field of a plane wave is given by (7)

$\bar{H} = 10\, e^{-\alpha x} \cos(\omega t - 0.5x)\, \hat{a}_z$ A/m . Find

i. Direction of propagation

ii. Loss tangent

iii. Attenuation constant

iv. Phase constant

v. 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 0.2 λ 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 Ω 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 0.2 λ from the load

v. Reflection coefficient at 0.2 λ 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)

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