Reg No.:_____

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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

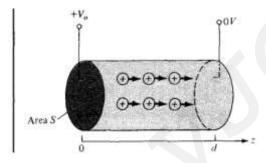
PART A

Answer any two full questions, each carries 15 marks.

Marks

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 V_0 . Find the expression of electric field in terms of V_0 , ρ_v and d.



2 a) In a lossy dielectric medium , characteristic impedance of the medium is 173 + (7) j100 Ω , Expression of Magnetic field of a plane wave is given by

 $\overline{H}=10~e^{\text{-}\alpha x}~cos(\omega\,t-0.5x)~\hat{a}_z\,A/m$. 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 (8) is the attenuation constant and β is the phase constant .
- 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)

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		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	(8)
		terminated with a load impedance of 50+200j . Find input impedance, reflection	
		coefficient at load end, reflection coefficient at the input end and VSWR.	
	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	
7	۵)	Answer any two full questions, each carries 20 marks.	(0)
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 50 Ω lossless transmission line. Using smith	(8)
		chart, find	
		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	(10)
		6 cm respectively, find the following when frequency of operation is 6 GHz.	
		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	(10)
		Transverse Magnetic Modes.	
	b)	Explain single stub tuning method using Analytical method.	(10)