8/2/2023 AN

Reg. No.													

Question Paper Code	11698

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Third Semester

Electronics and Communication Engineering

(Common to Fourth Semester - Computer and Communication Engineering)

20ECPC302 - ELECTROMAGNETIC FIELDS AND WAVEGUIDES

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	Define surface charge density. Write its unit.	2,K1,CO1
2.	What are null identities?	2,K1,CO1
3.	Define point form of ohm's law.	2,K1,CO2
4.	State Ampere circuital law.	2,K1,CO2
5.	List out the properties of dielectric materials.	2,K1,CO3
6.	Find the mutual inductance of two inductively tightly coupled coils with self-inductance of 25mH and 100mH.	2,K2,CO3
7.	Define Lenz's law.	2,K1,CO4
8.	For 1A conductor current in copper wire, find the corresponding displacement current at 100MHz. Assume for copper $\sigma = 5.8 \times 10^7$ mho/m.	2,K2,CO4
9.	Find the velocity of a plane wave in a lossless medium having a relative permittivity of 5 and relative permeability of 2.	2,K2,CO5
10.	Find the value of free space intrinsic impedance.	2,K1,CO5

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	Evaluate Stoke's theorem for a vector field $F = r^2\cos\phi\ ar + 2\sin\phi\ az$ around the close path L defined by $0 \le r \le 3$, $0 \le \phi \le 45^o$ and $Z = 0$.	13,K3,CO1
		OR	
	b)	Verify divergence theorem for $F = x^2\ ax + z\ ay + yz\ az$ taken over the cube bounded by x=0,x=1,y=0,y=1,z=0 and z =1.	13,K3,CO1
12.	a)	Derive the differential form of Biot Sarvat's law and discuss the significance of Biot Sarvat's law.	13,K2,CO2
		OR	
	b)	Derive the Ampere's Circuitry law and discuss any two applications.	13,K2,CO2

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create

13. a) (i) Derive the expression of capacitance due to cylindrical capacitor. *6,K2,CO3*

(ii) A spherical condenser has capacity of 54pF .It consists of two concentric spheres differing radii by 4cm having air as dielectric. Find their radii. *7,K3,CO3*

OR

b) Prove that $\frac{\tan\theta i}{\tan\theta r} = \frac{\mu r1}{\mu r2}$ where θi is the angle of incident in magnetic medium 1 and θr is the angle of refraction in magnetic medium 2. *13,K3,CO3*

14. a) Derive the time varying Maxwell's equations in point and integral form from the basic laws and explain the significance of each equation in detail. *13,K2,CO4*

OR

b) Derive the general wave equation with expressions. *13,K2,CO4*

15. a) Find the wave equations governing the E and H field in a source free conducting medium with parameters Ɛ,μ,σ. *13,K2,CO5*

OR

b) (i) State and prove the Poynting theorem. *8,K2,CO5*

(ii) Describe the Poynting vector, average power and instantaneous power. *5,K2,CO5*

PART - C (1 × 15 = 15 Marks)

16. a) An air filled rectangular waveguide of dimensions a = 4.5 cm and b = 3 cm operates in the TM_{11} mode. Find the cut off wavelength and characteristic wave impedance at a frequency of 9 GHz. *15,K3,CO6*

OR

b) Derive the field expression for TE wave propagation in circular waveguide stating the necessary assumptions. *15,K2,CO6*