Reg. No.												

Question Paper Code	12082

B.E. / B.Tech - DEGREE EXAMINATIONS, APRIL / MAY 2023

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.	Find the unit vector normal to the plane containing the two coplanar vectors A = 3ax +4ay-5az and B =-6ax+2ay+4az.	2,K2,CO1
2.	Find the gradient of the scalar component $\alpha = \frac{40\cos\theta}{r^2}$ at $P(3,60^\circ,30^\circ)$	2,K1,CO1
3.	A charge is distributed on x-axis of a Cartesian system having a line charge density of $3x^2 \mu C/m$ and find the total charge over the length of 10m.	2,K2,CO2
4.	State the Coulomb's Law.	2,K1,CO2
5.	Define Torque.	2,K1,CO3
6.	What is the magnetization in a magnetic material where $\mu = 1.8 \times 10^{-5}$ H/m and H = 120 A/m?	2,K2,CO3
7.	Obtain the Maxwell equation for static field.	2,K1,CO4
8.	State the Poynting Theorem.	2,K2,CO4
9.	Define dominant mode also list the dominant modes in TE and TM for rectangular waveguides.	2,K2,CO6
10.	Define guided wavelength.	2,K2,CO6

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	Verify the divergence theorem for the vector field $D=5(r^2/4)a_r C/m$ r=4m & $\theta=\pi/4$.	13,K2,CO1
		OR	
	b)	Explain in detail about the various types of coordinate systems with necessary equations.	13,K2,CO1

12. a) (i) State & Prove Ampere's Circuital law. *6,K2,CO2*

(ii) Derive the magnetic field intensity at the centre of the circular loop. *7,K2,CO2*

OR

b) Discuss about the electric potential and also obtain potential due to line charge. *13,K2,CO2*

13. a) (i) Let A=(3y-z)ax+2xzayWb/m in a certain region of frees pace. Show that A is Solenoidal. Also find the A , B , H , J at (2,-1,3). *6,K3,CO3*

(ii) Discuss about the magnetic boundary conditions between two different medias. *7,K3,CO3*

OR

b) A parallel plate capacitor having area of $1m^2$, distance between the plates 0.01m thickness of the wood is 0.002m. The relative dielectric constant of wood is 6 times of air. Calculate the capacitance of the system. *13,K3,CO3*

14. a) (i) In a material for which σ=5.0 S/m & ε_r=1, the electric field intensity is $E=250\sin 10^{10}tV/m$. Find the conduction & displacement current densities and the frequency at which both having equal magnitudes. *6,K3,CO4*

(ii) Obtain wave equation in phasor form & also obtain the attenuation & phase constant. *7,K3,CO4*

OR

b) Explain the basic laws and derive the expression of Maxwell Equation. *13,K3,CO4*

15. a) Explain the characteristics of rectangular waveguides and also explain the TEM waves in detail. *13,K3,CO6*

OR

b) When a TE_{10} mode is propagated through a standard rectangular waveguides, the guide wavelength measured is 8 cm and when TE_{11} modes are propagated through the guide wavelength increases to 12 cm. If the operating frequency for both modes is 6 GHz. Calculate a and b for the guide. *13,K3,CO6*

PART - C (1 × 15 = 15 Marks)

16. a) Write about plane waves in lossy and lossless medium. *15,K3,CO5*

OR

b) In free space $E=50\cos(\omega t-\beta z)ax$ V/m. Find the average power crossing a circular area of radius 2.5m in the plane z=0 assume $E_m=H_m\eta_0$. *15,K3,CO5*