GPCET

SET NO: IV

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY::KURNOOL

(Autonomous)

II B.Tech II SEM (R23) MID-I Examinations – Feb'2025

Department of Electronics and Communication Engineering

Sub: EMTL (A40408) **Date: 01-03-2025**

Time: 90 min **Max. Marks: 30**

Answer all the Questions (3X10=30M)

		Marks	Unit	CO	Cognitive Level
1	Define electric field intensity. Point charges of 5nC and -2nC are located at (2, 0, 4) and (-3, 0, 5) respectively. Find the electric field E at (1, -3, 7).	10M	I	CO3	Apply
	(OR)				
2	State and prove Gauss's law. Express Gauss's law in both integral and differential forms. Also discuss its applications.	10M	I	CO3	Understand
3	(a) Determine electric flux density, D at (4, 0, 3) , if there is point charge of -5π mC at (4, 0, 0) and line charge 3π mC/m along the y-axis. (b) What are the isotropic and homogeneous dielectric materials.	5+5 M	I	CO3	Apply
	(OR)				
4	a) Differentiate self-inductance and mutual inductance. b) Discuss about the magnetic vector potential.	5+5 M	II	CO4	Analyze
5	Define Ampere's law. Plane y=1 carries current k= 100 ax mA/m. Find H at (i) (0, 0, 0) (ii) (1, 3, -3)	10M	II	CO4	Apply
	(OR)				
6	(a) State and explain Faraday's law. (b) Explain Maxwell's equations integral and differential form.	5+5 M	II	CO4	Understand

Signature of faculty

Signature of HOD

GPCET

SET NO: I

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY::KURNOOL

(Autonomous)

II B.Tech II SEM (R23)MID-II Examinations–April/May 2025

Department of Electronics and Communication Engineering

Sub: EMTL (A40408)

Time: 90 min

Date:29-04-2025

Max.Marks:30

Answer all the Questions (3X10=30M)

		Marks	Unit	CO	Cognitive Level
1	State and prove Poynting theorem? Derive the expression for Poynting vector.	10M	III	CO1	Understand
	(OR)				
2	a) Describe the concept of Reflection of an EM wave by a perfect dielectric at oblique incidence. b) Explain the concept of Brewster Angle.	5+5 M	III	CO1	Understand
3	A distortion less line has Zo=60Ω, α=20Np/m, u=0.6c, where c is the Speed of light in a vacuum. Find R,L,G,C,and λ at 100MHz.	10M	IV	CO2	Apply
	(OR)				
4	Draw the equivalent circuit of a 2-wire transmission line. Explain primary & secondary constants.	10 M	IV	CO2	Understand
5	Write a note on a) Quarter wave transformer b)Single stub matching	5+5 M	V	CO2	Analyze
	(OR)				
6	Analyze the input impedance of 2- wire transmission, when load is S/C, O/C and Matched.	10M	V	CO2	Analyze

Signature of faculty

Signature of HOD

CODE: A40408 | R23 | H.T.No:

G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)

B.Tech II Year II Semester Regular Examinations May 2025
Subject Name: **EM WAVES AND TRANSMISSION LINES**
Branch: **Electronics and Communication Engineering**

Time: 3 Hours | **SET-1** | **Max. Marks: 70**

Instructions:
1. Answer all 10 questions from Part-A. Each question carries two marks
2. Answer one full question from each unit in Part-B. Each full question carries 10 marks

PART-A					
1	a	Define Electric potential.	2M	CO1	BTL2
	b	Distinguish between convection and conduction currents.	2M	CO1	BTL4
	c	State Biot Savart's law and write its expression.	2M	CO2	BTL1
	d	State Faraday's Law	2M	CO2	BTL1
	e	Define total internal reflection and mention its conditions.	2M	CO3	BTL2
	f	What is a uniform plane wave?.	2M	CO3	BTL1
	g	Define primary and secondary constants? Give the relation between them.	2M	CO4	BTL1
	h	Define group velocity and write its expression.	2M	CO4	BTL3
	i	What is Stub Matching?	2M	CO5	BTL1
	j	Write short notes on Quarter wave transformer.	2M	CO5	BTL1
PART-B					
UNIT-I					
2		Develop the expression for electric field intensity at any point due to finite length line charge with suitable sketches.	10M	CO1	BTL6
OR					
3		Define capacitance and also explain the parallel plate and co axial capacitors.	10M	CO1	BTL2
UNIT-II					
4		Derive the boundary conditions at the interface between Dielectric-Dielectric and Dielectric-Conductor	10M	CO2	BTL4
OR					

5	a	Explain the principle of transformer emf and motional emf	5M	CO2	BTL2
	b	Given $J=10^3 \sin\theta$ ar A/m^2 . Solve for the current passing through a spherical shell of r=0.2cm.	5M	CO2	BTL3
		UNIT-III			
6		Define Brewster's Angle and obtain an expression for the same in terms of medium parameters.	10M	CO3	BTL4
		OR			
7	a	Define the following terms with their expressions i) Critical Angle, ii) Total Internal Reflection, iii) Surface Impedance	5M	CO3	BTL1
	b	Investigate the relation between E and H in a lossless medium	5M	CO3	BTL6
		UNIT-IV			
8		Develop the expressions for transmission line equations for voltage and current.	10M	CO4	BTL6
		OR			
9		i)A transmission line has R = 30 ohm/m , G = 0 , L = 100 mH/m, C = 200nF/m and operating at f = 1MHz. Determine its characteristic impedance and phase constant. ii) The attenuation constant on a 50Ω distortion less transmission line is 0.01dB/m. The line has a capacitance of 0.1nF/m. Find the resistance, inductance and conductance per meter of the line.	10M	CO4	BTL4
		UNIT-V			
10		Define what Impedance Transformation is and Derive the Z_{in} expressions for Eighth wave ($\lambda/8$), Quarter wave ($\lambda/4$), and Half wave ($\lambda/2$) line impedance transformations.	10M	CO5	BTL2
		OR			
11		Explain about single stub matching and Explain the procedure to determine the length and location of Single Stub matching for a transmission line.	10M	CO5	BTL2

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UNIT-III

1. State and prove Poynting theorem? Derive the expression for Poynting vector.

2. a) Describe the concept of Reflection of an EM wave by a perfect dielectric at oblique incidence.

b) Explain the concept of Brewster Angle.

3. Analyze plane wave propagation in good conductor and free space medium.

4. Explain reflection and refraction of plane wave at normal incidence.

5. a) What is polarization? Explain different types of polarization.

b) Discuss about skin depth and loss tangent.

6. a) Describe the concept of Reflection of an EM wave by a perfect dielectric at oblique incidence.

b) Explain the concept of standing waves.

7. Analyze plane wave propagation in lossless dielectric, good conductor and free space medium.

8. Derive EM wave equations which is travelling in z-direction.

UNIT-IV

1. a) Draw the equivalent circuit of a 2-wire transmission line. Explain primary & secondary constants.

b) Given a 2-wire transmission line with the following parameters per unit length: R= 20Ω/km, L=1 mH/km, G=0.01 μS/m, C=100 nF/km, Operating frequency f=1 MHz. Calculate the characteristic impedance $Z0$.

2. Derive transmission line equations? State the condition for lossless and distortion less transmission?

3. a) What are the different types of transmission lines? Draw equivalent circuit of a 2-wire transmission line.

b) A distortion less line has Zo=60Ω, α=20Np/m, u=0.6c, Where c is the Speed of light in a vacuum. Find R,L,G,C,and λ at 100MHz.

4. (a) Discuss about Input Impedance of a two-wire Transmission line?

(b) Describe the impact of Reflection coefficient on transmission line?

5. What are the transmission line parameters? State the condition for lossless and distortion less transmission?

6. Define the term characteristic impedance? Relate the expression in distortion less and loss less media.

7. A distortion less line has Zo=60Ω, α=20Np/m, u=0.6c, where c is the Speed of light in a vacuum. Find R,L,G,C,and λ at 100MHz.

UNIT-V

1. Write a note on a) Quarter wave transformer

b) Single stub matching

2. Analyze the input impedance of 2- wire transmission, when load is S/C, O/C and Matched.

3. a) Write a short note on Smith Chart

b) A generator of 1 V, 1 kHz supplies power to 1000 km long open wire line terminated in Z0 with the primary constants R=10.4 Ω, L=3.7 mH, G=0.5 $\mho$, and C=0.00835 μF. Calculate the: (i) Characteristic impedance. (ii) Propagation constant

4. Derive the equation for input impedance of a 2-wire transmission line.

5. Relate Quarter wave transformer with a Single stub in impedance matching

6. Derive the equations of attenuation constant and phase constant of a lossless and distortion less transmission line in terms of R, L, C & G.

7. a) Explain about UHF transmission lines.

b) Derive expression for Reflection Coefficient and VSWR of a 2-wire transmission line.

8. Explain about Smith Chart and Write the applications of Smith Chart.