INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	**ELECTROMAGNETIC THEORY AND TRANSMISSION LINES**
Course Code	:	**AEC007**
Class	:	**B. Tech IV Semester**
Branch	:	**ECE**
Academic Year	:	**2018– 2019**
Course Coordinator	:	**Dr.S.Pedda Krishna,Professor,ECE**
Course Faculty	:	**Dr.P.Ashok Babu,Professor & HOD.** **Mrs.A.Usha Rani,Assistant Professor** **Mr.Murali Krishna, Assistant Professor** **Dr.S.Pedda Krishna,Professor.**

COURSE OBJECTIVES:

The course should enable the students to:

S. NO	DESCRIPTION
I	Formulate and solve problems involving number systems and operations related to them and generate different digital codes. .
II	Describe and analyze functions of logic gates and optimize the logic functions using K -map and Quine - McClusky methods.
III	Demonstrate knowledge of combinational and sequential logic circuits elements like Adders, Multipliers, flip-flops and use them in the design of latches, counters, sequence detectors, and similar circuits
IV	Design a simple finite state machine from a specification and be able to implement this in gates and edge triggered flip-flops

COURSE LEARNING OUTCOMES:

Students, who complete the course, will have demonstrated the ability to do the following:

CAEC007.01	Understand the different types of 3D co-ordinate systems, scalars and vectors, physical significance of divergence, curl and gradient.
CAEC007.02	Understand the concepts of coulomb's law and gauss's law to different charge distributions like point charge, line charge, surface charge and volume charge. Analyze its applications.
CAEC007.03	Understand the applications of Laplace's and Poisson's equations to solve problems on capacitance of different charge distributions.
CAEC007.04	Understand the physical significance of Biot-Savart's law and Ampere's Circuit law for different current distributions and analyze its applications.
CAEC007.05	Evaluate the physical interpretation of Maxwell's equations and applications for various fields like antennas and wave guides.
CAEC007.06	Derive the boundary conditions between different media like dielectric to conductor, conductor to free space.
CAEC007.07	Analyze and apply the maxwell's equations to derive electromagnetic wave equations for different media.
CAEC007.08	Understand the behavior of electromagnetic waves incident on the interface between two different media.
CAEC007.09	Formulate and analyze problems in different media such as lossy, lossless with boundaries using uniform plane waves.

CAEC007.10	Understand the significance of transmission lines and its types, derive their primary constants and secondary constants.
CAEC007.11	Understand the concept of attenuation, loading, and analyze the loading technique to the transmission lines.
CAEC007.12	Understand the design of various transmission lines with respect to distortion, loss, impedance matching, VSWR and reflection coefficient.
CAEC007.13	Understand the impedance transformation for different lengths such as λ/4,λ/2,λ/8 transmission lines.
CAEC007.14	Understand the design of ultra high frequency transmission lines for different applications by using single and double stub matching techniques.
CAEC007.15	Formulate and analyze the smith chart to estimate impedance, VSWR, reflection coefficient, OC and SC lines.
CAEC007.16	Apply the concept of electromagnetic fields to understand and analyze land mobile communications.
CAEC007.17	Acquire the knowledge and develop capability to succeed national and international level competitive examinations.

TUTORIAL QUESTION BANK

S. No	QUESTION	Blooms Taxonomy Level	Course learning Outcome
UNIT-I			
ELECTROSTATICS			
PART-A (SHORT ANSWER QUESTIONS)			
1	Define unit vector?	Understand	CAEC007.01
2	State Coulomb's law?	Understand	CAEC007.02
3	Write the expression for Coulombs law in vector form and explain the terms.	Understand	CAEC007.02
4	Specify the physical significance of divergence and stokes.	Remember	CAEC007.01
5	State Gauss's law? Write the Maxwell's first equation using Gauss's law	Understand	CAEC007.01
6	Give the expression for the potential difference of two concentric conducting sphere of radius a and b?	Remember	CAEC007.01
7	List the applications of Gauss law?	Understand	CAEC007.01
8	Define electric flux and give the relation between electric field intensity and electric flux density?	Remember	CAEC007.01
9	Give the relation between electric flux and flux density?	Understand	CAEC007.01
10	State the Divergence theorem and give the expression?	Remember	CAEC007.01
11	State the stoke's theorem and give the expression?	Understand	CAEC007.01
12	Define electric potential?	Remember	CAEC007.01
13	What is relation between E and V? Derive the relation between E and V.	Understand	CAEC007.03
14	From Maxwell's equation, Derive Poisson's and Laplace equations	Remember	CAEC007.01
15	Write boundary conditions for conducting media?	Remember	CAEC007.01
16	What is "Relaxation time" and discuss its effect on conductors?	Remember	CAEC007.01
PART-B (LONG ANSWER QUESTIONS)			
1	State Gauss's law. Using divergence theorem and Gauss's law, relate the displacement density D to the volume charge density ρ_v.	Understand	CAEC007.01
2	Explain the following terms: i. Homogeneous and isotropic medium and ii. Line, surface and volume charge distributions.	Understand	CAEC007.01
3	Derive the boundary conditions for the tangential and normal components of Electrostatic fields at the boundary between two perfect dielectrics.	Remember	CAEC007.01
4	Obtain the expression for the capacitance of a coaxial capacitor?	Understand	CAEC007.01
5	Derive poisons and Laplace's equations and mention their applications?	Remember	CAEC007.01
6	Explain the terms conduction current, convection current and relaxation time.	Understand	CAEC007.01
7	An electric field enters from air into a dielectric slab at an oriented of θ1. Show that the electric field leaves the dielectric slab at the same orientation of θ1 to define boundary conditions.	Understand	CAEC007.01

S. No	QUESTION	Blooms Taxonomy Level	Course learning Outcome
8	Using Gauss's law derive expressions for electric field intensity and electric flux density due to an infinite sheet of conductor of charge density ρ_s C/cm	Remember	CAEC007.01
9	State coulomb's law and write the equation for F that exist between two unlike charges**?**	Understand	CAEC007.01
10	A sphere of radius 'a' is filled with a uniform charge density of ρ_v C/m^2 .Determine the electric field inside and outside the sphere.	Understand	CAEC007.01
11	A circular ring of radius *a* carries a uniform charge p_L C/m and is placed on the xy plane with axis the same as the z axis. Find the Electric Field at the point (0, 0, ~~h) a~~long its ~~axis. What~~ values of *h* gives the maximum value of E?	Understand	CAEC007.01
PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)			
1	Point charges Q1 and Q2 are located at (4, 0, -3) and (2, 0,1), respectively. If Q2 = 4 nC, find Q1 such that. i. The E at (5, 0, 6) has no Z-component. ii. The force on a test charge at (5, 0, 6) has no X-component.	Remember	CAEC007.01
2	Derive the boundary conditions for the tangential and normal components of Electrostatic fields at the boundary between two perfect dielectrics.	Understand	CAEC007.01
3	A parallel plate capacitance has 500mm side plates of square shape separated by 10mm distance. A sulphur slab of 6mm thickness with $\varepsilon_r = 4$ is kept on the lower plate find the capacitance of the setup. If a voltage of 100 volts is applied across the capacitor, calculate the voltages at both the regions of the capacitor between the plates.	Remember	CAEC007.01
4	If point charge 3 μC is located at the origin. Also there are two more charges -4 μC and 5 μC are located at (2, -1, 3) and (0, 4, -2) respectively. Find potential at (-1, 5, 2) Assume zero potential at infinity.	Remember	CAEC007.01
5	A point charge of 5 nC is located at the origin. If V = 2V at (0, 6, -8), find i) The potential at A (-3, 2, 6) ii) The potential at B (1, 5, 7) iii) The potential difference V_{AB}	Understand	CAEC007.01
6	Three point charges 2μc,4 μc,8 μc are located at(0,0,0), (0,0,1), and (1,0,0) respectively. Find energy in the system.	Understand	CAEC007.01
7	A parallel-plate capacitor has plates located at z = 0 and z = d. The region between platesis filled with a material containing volume charge of uniform density ρ_0 C/m3, and which has permittivity. Both plates are held at ground potential. i) Determine the potential field between plates ii) Determine the electric field intensity, E between plates.	Remember	CAEC007.01
8	Concentric conducting spheres are located at r = 5 mm and r = 20 mm. The region between the spheres is filled with a perfect dielectric. If the inner sphere is at 100 V and the outer sphere at 0 V: i) Find the location of the 20 V equipotential surface, ii) Find Er,max iii) Find εr if the surface charge density on the inner sphere is 1.0 μC/m^2	Remember	CAEC007.01
9	Three point charges 5μc,8 μc,2 μc are located at(-2,4,6)(0,0,1) and (1,1,2) respectively. Find energy in the system.	Understand	CAEC007.01
10	A uniform line charge in 2.5μc/m2 lies along the Z-axis and a concentric circular cylinder of radius 3m has a surface charge of –0.12μc/m2 . Both the distributions are infinite in extent with respect to Z-axis using Gauss's law find D in all regions, the region is free space.	Understand	CAEC007.01

S. No	QUESTION	Blooms Taxonomy Level	Course learning Outcome
UNIT-II			
MAGNETOSTATICS			
PART-A(SHORT ANSWER QUESTIONS)			
1	State Biot- Savart's law?	Remember	CAEC007.06
2	State Ampere's force law?	Understand	CAEC007.06
3	State Ampere's circuital law?	Remember	CAEC007.05
4	Is magneto static field is conservative? Explain.	Remember	CAEC007.02
5	Write the Maxwell's equations for magneto static fields	Understand	CAEC007.06
6	Define magnetic vector potential and magnetic scalar potential?	Remember	CAEC007.04
7	Write the expression for Lorentz force equation.	Understand	CAEC007.04
8	Define inductance? What's the energy stored in an inductor?	Understand	CAEC007.06
9	Write Maxwell's equation for static electric field and steady magnetic field, both in point and integral form.	Understand	CAEC007.05
10	Determine the total energy stored in a spherical region 1cm in radius, centered at the origin in free space, in the uniform field of $H = -600a_y$ A/m.	Understand	CAEC007.03
11	State Gauss law for magnetic fields?	Remember	CAEC007.03
12	Define displacement current density.	Remember	CAEC007.03
13	Define magnetic flux density along with equation?	Understand	CAEC007.03
14	Describe transformer and motional electromotive forces (emfs)in the context of Faraday's law.	Remember	CAEC007.03
15	Derive the expression for magnetic force due to current conductor	Understand	CAEC007.03
PART-B (LONG ANSWER QUESTIONS)			
1	Derive the boundary conditions between conductor and dielectric?	Remember	CAEC007.06
2	Describe the inconsistency in Ampere's Law? How it is rectified by Maxwell? (or) What is Inconsistency of Ampere's Law and how it is modified	Remember	CAEC007.06
3	Describe in detail the Faraday's law of induction. Write down the mathematical statement of this law?	Understand	CAEC007.05
4	Derive Maxwell's equations in integral form and differential form for time varying fields.	Understand	CAEC007.06
5	Define and explain the terms scalar and vector magnetic potential? How to determine these quantities for a magnetic field?	Remember	CAEC007.06
6	Derive Lorentz force equation?	Understand	CAEC007.06
7	Derive the equation of force on a differential current element?	Remember	CAEC007.02
8	Derive the inductance of Solenoid?	Understand	CAEC007.04
9	Obtain Maxwell's equations in phasor form?	Remember	CAEC007.04
10	Derive the boundary conditions between conductor and free space?	Remember	CAEC007.06
11	Find the field at the centre of a circular loop of radius 'a', carrying a current I along φ in z = 0 plane.	Understand	CAEC007.04
PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)			
1	A steady current element 10^{-3} a_z Am is located at the origin in free space. Describe the the magnetic field B due to this element at the point (1,0,0) m?	Understand	CAEC007.04
2	A magnetic field intensity due to a current source is given	Remember	CAEC007.06

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S. No	QUESTION	Blooms Taxonomy Level	Course learning Outcome
	by $H = y\cos(\alpha x)\hat{a}_x + (y + e^x)\hat{a}_z$. Describe the current density over the yz plane?		
3	A radial field $H = \frac{2.39 \times 10^6}{r}(\cos\phi)a_r$ A/m exists in free space. Find the magnetic flux crossing the surface defined by $0 < \phi < \pi/4$ and $0 < z < 1$ m.	Understand	CAEC007.04
4	Calculate magnetic field intensity, if the vector magnetic potential within a cylindrical conductor of radius 'a' is $A = \frac{\mu_0 I r^2}{4\pi a^2}a_z$	Understand	CAEC007.04
5	Calculate the force on al straight conductor of length 30cm carrying a current of 5 A in a_z direction and the magnetic field B = $3.5x10^{-3}(a_x-a_y)$Tesla where a_x and a_y are unit vectors.	Remember	CAEC007.06
6	A Solenoid 3cm in length carries a current of 400 mA. If the solenoid is to produce a magnetic flux density of 5 mWb/m^2, how many turns of wire are needed?	Remember	CAEC007.06
7	A Toroid of circular cross section whose center is at the origin and axis the same as the z-axis has 1000 turns with ρ_0=10 cm, a=1 cm.If the toroid carries a 100mA current.Find|H| at (3,-4,0) and (6,9,0)	Remember	CAEC007.02
8	Calculate H at (3m, -6m, 2m) due to a current element of length 2mm located at the origin in free space that carries current 16mA in the positive y-direction.	Understand	CAEC007.06
9	An infinitely long conducting filament is placed along the x- axis and carries current 10mA in the x- direction. Find H at (-2,3,4).	Understand	CAEC007.02
10	Plane y = 1 carries current K = 50 a_z mA/m. Find H at i) (0,0,0) ii) (1,5,-3)	Understand	CAEC007.03
UNIT-III			
UNIFORM PLANE WAVES			
PART-A(SHORT ANSWER QUESTIONS)			
1	Write the expression for depth of penetration of a good conductor?	Remember	CAEC007.08
2	Describe polarization of wave?	Remember	CAEC007.08
3	Mention different types of polarization of a uniform plane wave?	Understand	CAEC007.08
4	Recall the values of conductivity (σ), permittivity (ϵ) and permeability (μ) for free space and lossless dielectric?	Understand	CAEC007.08
5	Recall the values of conductivity (σ), permittivity (ϵ) and permeability (μ) for perfect conductor and lossy dielectric?	Remember	CAEC007.08
6	Define phase velocity and also write its expression?	Understand	CAEC007.08
7	What is intrinsic impedance? Write the equation of intrinsic impedance in both free space and in any medium?	Remember	CAEC007.08
8	Write the equation of attenuation constant in both free space and in any medium?	Remember	CAEC007.08
9	Write the equation of phase constant impedance in both free space and in any medium? Write the expression for attenuation and phase constants of uniform plane wave	Understand	CAEC007.08
10	Recall the equations of β, λ and 'v' for the wave propagating through perfect dielectric?	Remember	CAEC007.08
11	Determine the depth of penetration for copper at 1MHz.	Remember	CAEC007.08
12	Describe the loss tangent?	Understand	CAEC007.08
13	Write the wave equation for **D** and **B** in the uniform medium?	Understand	CAEC007.08

S. No	QUESTION	Blooms Taxonomy Level	Course learning Outcome
14	Write the wave equation for **E** and **H** in the uniform medium?	Remember	CAEC007.08
15	Recall the equations of γ, α , and 'v' for the wave propagating through perfect dielectric?	Understand	CAEC007.08
16	Write the characteristics of uniform plane wave?	Remember	CAEC007.08
1	Write briefly about lossy dielectric?	Understand	CAEC007.08
2	Show the effect of attenuation constant α, on amplitude of a wave propagation in good conductor pictorially?	Remember	CAEC007.08
3	Describe the Brewster angle?	Understand	CAEC007.08
4	Define Surface impedance?	Remember	CAEC007.08
5	Write snell's law of reflection and refraction?	Remember	CAEC007.08
6	Describe the total internal reflection?	Understand	CAEC007.08
7	Describe the Critical angle?	Remember	CAEC007.08
8	Write the expression for Brewster angle when a wave is parallely polarized?	Remember	CAEC007.08
9	Define transmission coefficient?	Understand	CAEC007.08
10	Distinguish between terms perpendicular polarization and parallel polarization for the case of reflection by a perfect conductor under oblique impedance?	Understand	CAEC007.08
11	Determine the critical angle for the electromagnetic wave passing through glass to air if ϵ_r for glass is 9.	Understand	CAEC007.08
12	Write the expression transmission coefficient of an EM wave when it is incident normally on a dielectric?	Remember	CAEC007.08
13	Write the expression reflection coefficient of an EM wave when it is incident normally on a dielectric?	Remember	CAEC007.08
14	Describe the difference between instantaneous poynting vector and complex poynting vector?	Understand	CAEC007.08
15	Write point form of Poynting theorem?	Remember	CAEC007.08
	PART-B(LONG ANSWER QUESTIONS)		
1	Obtain wave equations for good conductors?	Remember	CAEC007.08
2	Explain the characteristics of wave in perfect dielectric?	Understand	CAEC007.08
3	Describe the meant by polarization of wave? When the wave is linearly polarized and circularly polarized?	Remember	CAEC007.08
4	Derive expression for intrinsic impedance in a uniform plane wave in a lossy dielectric?	Remember	CAEC007.08
5	Explain skin depth and derive expression for depth of penetration for good conductor?	Understand	CAEC007.08
1	Derive the expression for reflection of a wave when incident on dielectric with oblique incidence with perpendicular polarization?	Understand	CAEC007.08
2	Define Brewster angle and derive an expression for Brewster angle when a wave is parallely polarized?	Understand	CAEC007.08
3	State and Prove Poynting theorem?	Understand	CAEC007.08
4	Explain the power loss in a plane conductor?	Remember	CAEC007.08
5	Derive the expression for power flow in a concentric cable?	Remember	CAEC007.08
	PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)		
1	Find the skin depth and surface resistance of an aluminum at 100 MHz having conductivity $\sigma = 5.8\text{x}10^7$ ʊ/m, $\mu_r = 100$.	Remember	CAEC007.08
2	The electric field in the free space is given by, $E = 50\cos(10^8 t + \beta x)\hat{a}_y$ V/ m . i) Find the direction of propagation ii) Calculate β and time it takes to travel a distance of λ/2.	Understand	CAEC007.08
3	A 10 GHz plane wave travelling in a free space has an amplitude of **E** as E_x =	Understand	CAEC007.08

S. No	QUESTION	Blooms Taxonomy Level	Course learning Outcome
	10 V/m. Find β, η, v, λ?		
4	A plane wave travelling in free space has an average Poynting vector of 5 watts/m^2. Find magnitude of electric field intensity?	Remember	CAEC007.08
5	A uniform plane wave of 200 MHz travelling in a free space impinges normally on a large block of material having ϵ_r =4, μ_r=9, σ = 0. Calculate transmission and reflection coefficients at the interface.	Understand	CAEC007.08
1	At a particular frequency, a medium has α = 0.1 Np/m, $\eta = 250\angle 35.26^{\circ}\Omega$. Calculate the loss tangent, loss angle and wave length.	Remember	CAEC007.08
2	In free space, the electric field component of TEM wave is $E = 10\sin(3\times10^8 t + y)\hat{a}_z$ V/ m . Determine its polarization. i) Find λ, T ii) Sketch the wave at t = 0, T/4 and T/2. iii) Calculate the corresponding H	Remember	CAEC007.08
3	A uniform wave in air has $E = 10\cos(2\pi\times10^6 t - \beta z)\hat{a}_y$ V/ m . Calculate i) β and λ. ii) Find H. iii) Sketch the wave at z = 0, λ/4 and λ/2.	Understand	CAEC007.08
4	A medium has the following constitutive parameters μ = μ_o. ε = 9ε_o, σ = 5 x 10^{-9} ʊ/m. Calculate the wavelength of a wave at 1 GHz propagating through the medium. Should the medium be regarded as free space, lossy dielectric, lossless dielectric, or good conductor.	Understand	CAEC007.08
5	In a certain medium $E = 10\cos(2\pi\times10^7 t - \beta x)(\hat{a}_y + \hat{a}_z)$ V/ m .If μ = 50μ_o, ε = 2ε_o, σ = 0. Find β and H .	Remember	CAEC007.08
	UNIT-IV		
	TRANSMISSION LINES CHARACTERISTICS		
	PART-A (SHORT ANSWER QUESTIONS)		
1	Define transmission line? Mention the various types of transmission lines?	Remember	CAEC007.11
2	Draw the equivalent circuit of the transmission line?	Understand	CAEC007.11
3	Write the differential form of transmission line equations?	Remember	CAEC007.11
4	Mention the types of distortions on the transmission lines?	Understand	CAEC007.11
5	Describe the distortion less transmission line? Is every loss less line is a distortion less line? Justify.	Understand	CAEC007.11
6	Define intrinsic impedance or characteristic impedance of free space.	Remember	CAEC007.09
7	Define wave length and phase velocity	Understand	CAEC007.09
8	Define group velocity	Remember	CAEC007.09
9	Describe the condition of loading in transmission lines?	Understand	CAEC007.09
10	Describe the value of characteristic impedance of free space?	Remember	CAEC007.09
11	Write secondary constants in terms of primary constants?	Remember	CAEC007.09
12	Calculate the characteristic impedance of a quarter wave transformer if a 120 Ω load is to be matched to a 75Ω line.	Understand	CAEC007.09
13	Write solution for V and I in exponential form?	Remember	CAEC007.09
14	Write solution for V and I in the form of hyperbolic functions?	Understand	CAEC007.09
15	Name and define the primary constants of transmission line? What are Primary and Secondary constants of transmission line	Understand	CAEC007.09
	PART-B (LONG ANSWER QUESTIONS)		
1	Starting from the equivalent circuit, derive the transmission line equations for V and I, in terms of the source parameters.	Understand	CAEC007.09
2	From the fundamental voltage and current equations of transmission line,	Remember	CAEC007.11

S. No	QUESTION	Blooms Taxonomy Level	Course learning Outcome
	derive Expression for input impedance Z_{in} of the line. Modify the expression for lossy & lossless cases.		
3	Describe the different distortions on a line and derive the conditions for distortion less transmission.	Understand	CAEC007.13
4	Describe the loading? Explain the different types of loading in transmission lines?	Remember	CAEC007.09
5	Describe the different distortions on a line and derive the conditions for minimum attenuation?	Understand	CAEC007.10
6	Derive the characteristic impedance Z_o from the initial equation of transmission line?	Understand	CAEC007.09
7	Derive the Propagation constant γ from the general equations of voltage and current?	Remember	CAEC007.09
8	Derive the expressions for α and β in terms of primary constants?	Remember	CAEC007.13
9	Define wave length, velocity of propagation and group velocity and write the respective equations?	Remember	CAEC007.11
10	Derive the expression for loss less transmission line?	Understand	CAEC007.11
	PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)		
1	At 8 MHz the characteristic impedance of transmission line is (40- j2) Ω and the propagation constant is (0.01+j0.18) per meter. Find the primary constants.	Remember	CAEC007.09
2	A loss less transmission line has 75 Ω characteristic impedance. The line is terminated in a load impedance of 50-j100 Ω. The maximum voltage measured on the line is 100V. Find the maximum current and minimum voltage on the line.	Remember	CAEC007.09
3	A transmission line in which no distortion present has the following parameters. Z_o=50 Ω, α = 20mN/m, V=0.7V_o . Determine primary constants and wave length at 0.1 GHz.	Understand	CAEC007.09
4	Calculate the characteristic impedance, the attenuation constant and phase constant of a transmission line if the following measurements have been made on the line Z_{OC}=550 Ω and Z_{SC} = 500 Ω.	Understand	CAEC007.09
5	A generator of 1V, 1 KHz supplies power to a 100 km long line terminated in Z_o and having the following constants, R = 10.4 Ω/km, L = 0.00367 H/km, G = 0.8x10^{-6} ℧/km and C = 0.00835x10^{-6} F/km. Calculate Z_o , attenuation constant α , phase constant β, wavelength λ and velocity V.	Remember	CAEC007.12
6	An open wire transmission line terminated in its characteristic impedance has the following primary constant at 1KHz. R=6 Ω/km,L=2 mH/km,G=0.5 u℧,C=0.005 uF/km. Calculate the phase velocity and attenuation in decibels suffered by a signal in a length of 100 kms.	Understand	CAEC007.12
7	The primary constants of a cable are R=80 Ω/km,L=2 mH /km and G=0.3 u℧ /km.C=0.01 uF/km. Calculate the secondary constants at a frequency of 1KHz.	Remember	CAEC007.13
8	A loss less transmission line has 115 Ω characteristic impedance. The line is terminated in a load impedance of 100-j250 Ω. The maximum voltage measured on the line is 120V. Find the maximum current and minimum voltage on the line.	Remember	CAEC007.12
	UNIT-V		
	UHF TRANSMISSION LINES AND APPLICATIONS		
	PART-A(SHORT ANSWER QUESTIONS)		
1	Describe the relationship between the short circuited impedance, open circuited impedance and characteristic impedance?	Understand	CAEC007.14
2	Define reflection coefficient and VSWR , Describe the relationship between them	Understand	CAEC007.14
3	Describe the matched transmission line .Why is matching of load impedance	Remember	CAEC007.14

S. No	QUESTION	Blooms Taxonomy Level	Course learning Outcome
	is needed.		
4	List the properties of smith chart?	Remember	CAEC007.14
5	Describe the meant by stub matching?	Understand	CAEC007.14
6	Describe the short circuited and open circuited lines?	Remember	CAEC007.14
7	Differentiate between matched and unmatched transmission line	Understand	CAEC007.14
8	Differentiate between single stub and double stub matching.	Understand	CAEC007.15
9	Why it is desirable to achieve an impedance match in a transmission line?	Remember	CAEC007.15
10	Write applications of quarter wave line?	Remember	CAEC007.15
11	Describe the significance of circle diagram?	Understand	CAEC007.15
12	A loss less line of 300 Ω characteristic impedance is terminated in a pure resistance of 200 Ω. Find the value of standing wave ratio.	Understand	CAEC007.15
13	Point out salient features of in a Smith chart.	Understand	
14	Define a standing wave and how it is produced?	Remember	CAEC007.15
15	List the applications of smith chart?	Understand	CAEC007.15
	PART-B(LONG ANSWER QUESTIONS)		
1	Explain the principle of impedance matching with quarter wave transformer?	Remember	CAEC007.14
2	Explain the significance and utility of λ/8, λ/4, and λ/2 line?	Remember	CAEC007.14
3	Explain the significance and design of single stub impedance matching. Discuss the factors on which length depends?	Understand	CAEC007.14
4	Describe the construction of smith chart and give its applications?	Apply	CAEC007.14
5	Explain with neat sketches how the input impedance of a lossless line varies with frequency?	Remember	CAEC007.14
6	Derive the relation between reflection coefficient and standing wave ratio?	Understand	CAEC007.14
7	Derive the expression for the input impedance of a uniform transmission line terminated with load Z_L. Hence discuss the properties of a quarter wave length and half wave length lines assuming the line to be loss less?	Understand	CAEC007.15
8	Explain the significance of V_{max} and V_{min} positions along the transmission line, for a complex load Z_R. Hence obtain expression for impedances at these positions?	Remember	CAEC007.15
9	Explain the method of determining the input impedance of line using smith chart for a lossless of length *l* at any frequency f for a complex load of Z_R.	Understand	CAEC007.15
10	Derive expression for the input impedance of a lossless line. Hence evaluate Z_{OC} and Z_{SC}, also sketch their variation with line length?	Remember	CAEC007.14
	PART-C (PROBLEM SOLVING AND CRITICAL THINKING QUESTIONS)		
1.	Find the characteristic impedance of a line at 1600 Hz if the following measurements have made on the line at 1600 Hz, Zoc =750 Ω and Zsc= 500 Ω.	Remember	CAEC007.14
2.	A transmission line of length 0.4λ has a characteristic impedance of 100 Ω and is terminated by a load impedance of 200+j180 Ω , by using smith chart find i) Reflection coefficient ii) VSWR iii) Input impedance of the line	Understand	CAEC007.14
3.	Calculate the characteristic impedance of a quarter wave transformer if a 120 Ω load is to be matched to a 75 Ω line?	Understand	CAEC007.14
4.	A transmission line having 50 Ω impedance is terminated in a load of (40+j30) Ω. Describe the the voltage standing wave ratio?	Understand	CAEC007.15
5.	A lossless line having an air dielectric has a characteristic impedance of 400 Ω. The line is operating at 200 MHz and Z_{in} = 200 − j200 Ω. Use the Smith chart , find: (a) SWR (b) Z_L if the line is 1 m long; (c) The distance from the load to the nearest voltage maximum	Understand	CAEC007.15
6.	A low loss line with Z_0=70 Ω is terminates in an impedance Z_R=115-j80 Ω,	Understand	CAEC007.15

S. No	QUESTION	Blooms Taxonomy Level	Course learning Outcome
	the wavelength of transmission is 2.5 m, using the given smith chart, find the VSWR, Z_{max}, Z_{min}.		
7.	Find input impedance of a coaxial line having Z_0=95 Ω. The line is 20m long short circuited at far end and operates at 10M Hz. Verify answer by solving using smith chart.	Understand	CAEC007.15
8.	A transmission line of characteristic impedance 600 Ω is terminated by a reactance of +j150 Ω, find the input impedance of a section 25 cm long at a frequency of 300 MHz , smith chart may be used.	Understand	CAEC007.15
9.	A 100 km long transmission line is terminated by a resistance of 200 Ω ,it has the following constants: Z_0=600 Ω, α =0.01 neper/km,β=0.03 radians/km. Find the reflection coefficient and the input impedance.	Understand	CAEC007.15
10.	Design a stub to match a transmission line which is connected to a load impedance of Z_L=450-j600 Ω. The characteristic impedance of the line is 300 Ω. The operating frequency is 20M Hz. Design using smith chart also.	Remember	CAEC007.14

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