Code No: R1622043 **R16** SET - 1

II B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
ELECTRO MAGNETIC WAVES AND TRANSMISSION LINES
(Com to ECE, EIE)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

PART –A

1. a) State and prove the Gauss law. (3M)
   b) State Amphere's circuital law. (2M)
   c) Define polarization and List its types. (3M)
   d) Differentiate conductors and Insulators. (2M)
   e) Define the terms phase velocity, group velocity (2M)
   f) List the applications of smith chart. (2M)

PART -B

2. a) Discuss the Maxwell's equations for electrostatic fields. (7M)
   b) Determine the capacitance of a coaxial cable per unit length using Maxwell's equations. (7M)

3. a) What is inconsistency associated with Amphere's law and Displacement current Density. (7M)
   b) State and explain the boundary conditions of the electric and magnetic fields. (7M)

4. a) What are the wave equations for a lossless medium and a conducting medium for sinusoidal variations? (7M)
   b) A lossy dielectric has an intrinsic impedance of $0 \angle 30200\ \Omega$ at a particular radian frequency ω. If, at that frequency, the plane wave propagating through the dielectric has the magnitude field component $H = 10\ e^{-\alpha x}\cos(\omega t - 0.5x)a_y$ A/m Find E and α. Determine the skin depth. (7M)

5. a) Explain oblique incidence wave propagation with perpendicular polarization. (7M)
   b) What is poynting theorem? Derive the expression for poynting vector. (7M)

6. a) Derive the primary & secondary constants for a low loss transmission line. (7M)
   b) Derive the expression for propagation constant of infinite transmission line. (7M)

7. a) Explain Quarter wave and Half wave Transmission Line. (7M)
   b) Explain how double stub is used for matching with suitable diagram? Derive equations for its length and location. (7M)
~~~~~~

Code No: R1622043 **R16** SET - 2

II B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
ELECTRO MAGNETIC WAVES AND TRANSMISSION LINES
(Com to ECE; EIE)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

PART –A

1. a) Define convection and conduction currents. (2M)
   b) Define scalar and vector magnetic potentials. (3M)
   c) Define Uniform plane wave. (2M)
   d) What is total internal reflection? Explain. (2M)
   e) Explain the advantages of loading and also discuss the disadvantages. (2M)
   f) Define VSWR. Give the relationship between VSWR and Reflection coefficient. (3M)

PART -B

2. a) State and explain Coulomb's Law. Define electric field intensity giving the units of various parameters involved. (7M)
   b) Derive Possion's and Laplace's equations from fundamentals. (7M)

3. a) State and explain Maxwell's equation in integral and point form for general time varying fields. (7M)
   b) State Maxwell's equations for magneto static fields. (7M)

4. a) Derive the expression for attenuation constant and phase constant in a lossy dielectric medium. (7M)
   b) A uniform plane wave propagating in a medium has $E = 2e^{-\alpha z}\sin(108t-\beta z)a_y$ V/m. If the medium is characterized by $\varepsilon_r = 1$, $\mu_r = 20$ and $\sigma = 3$ S/m, find α, β and H. (7M)

5. a) Define Brewster angle and derive an expression for Brewster angle when a wave is parallelly polarized. (7M)
   b) Derive the expression for surface impedance of a conductor. (7M)

6. a) Starting from the equivalent circuit, derive the transmission line equations for V and I, in terms of the source parameters. (7M)
   b) Derive the condition for distortion less transmission line. (7M)

7. a) Define the reflection coefficient and derive the expression for input impedance in terms of reflection coefficient. (7M)
   b) Explain the basis for construction of Smith chart. Illustrate as to how it can be used of an Admittance chart. (7M)
~~~~~~

Code No: R1622043 **R16** SET - 3

II B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
ELECTRO MAGNETIC WAVES AND TRANSMISSION LINES
(Com to ECE, EIE)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

PART –A

1. a) Write Expression for Energy stored in Electrostatic field. (2M)
   b) Define Ampere's Force Law. (2M)
   c) Explain about wave propagation in Free space. (3M)
   d) Explain wave propagation in good conductors. (3M)
   e) Define Infinite Line and Lossless line. (2M)
   f) What are the applications of Quarter-wave Transmission line? (2M)

PART -B

2. a) Explain the terms and write expressions for Energy density and Dielectric constant. (7M)
   b) Define Electric potential and derive the relationship between electric potential and electric field. (7M)

3. a) State and Derive the boundary condition for electric and magnetic field at any surface of discontinuity. (7M)
   b) Three very long parallel conductors are in free space. They lie in one plane space by 50cm. Each of the conductors carries a current of 100 Amps so that in first and second one, the current has same direction. (7M)
   What is the force acting on a meter of first, second and third conductors?

4. a) Show that when a uniform plane wave propagating in particular direction, it does not contain any field components in that particular direction. (7M)
   b) Show that in a good conductor, the skin depth δ is approximately given by $\delta = 2\pi/\lambda$. (7M)

5. a) Explain about different types of transmission lines and write the applications of transmission lines. (7M)
   b) Discuss about reflection and refraction of plane waves for normal incidence at the interface between two dielectrics. (7M)

6. a) Find Z0, Vp, Vg for the dominant mode propagating in rectangular wave guide with a=2.2cm,b=1 cm. Frequency of propagation is 10 GHz. Determine any other modes that are propagating in the waveguide. (7M)
   b) Derive the condition for distortion less transmission line and also plot the open circuit short circuit wave forms of voltage and current at the receiving end. (7M)
~~~~~~

7. a) A loss less line of 300Ω impedance is terminated in load impedance of 100+j650Ω the frequency of operation is 60MHz. Find the length and location of a single stub needed for impedance match. (7M)
   b) The VSWR measured of UHF transmission line, working at a frequency of 300MHz is found to be 2.If the distance between load and voltage minimum is 0.8 meter. Calculate the value of load impedance. (7M)

Code No: R1622043 **R16** SET - 4

II B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
ELECTRO MAGNETIC WAVES AND TRANSMISSION LINES
(Com to ECE, EIE)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

~~~~~~

PART –A

1. a) Define Electric flux density. (2M)
   b) Write the boundary conditions at the interface between Dielectric-Dielectric and Dielectric-conductor. (3M)
   c) What is skin depth? Mention its importance. (3M)
   d) Write Expression for Power Loss in a Plane Conductor. (2M)
   e) What are the applications of poynting theorem? (2M)
   f) What are the advantages and disadvantages of stub matching. (2M)

PART -B

2. a) Write a short notes on (7M)
      i) Equation of continuity for time varying fields.
      ii) Relaxation time
   b) Derive an expression for electric field intensity due to a finite length line charge along the z-axis at an arbitrary point P(x, y, z). (7M)

3. a) Find an expression for the magnetic field produced by a straight current carrying conductor at a distance x from it. (7M)
   b) Define the term Magnetic flux density and explain why isolated magnetic pole does not exist. (7M)

4. a) Explain the relations between E and H in Uniform plane wave. (7M)
   b) Derive Wave Equations for conducting and perfect dielectric Media. (7M)

5. a) Show that the field existing in the second medium under conditions of total internal reflection is a non-uniform plane wave and slow wave. (7M)
   b) For plane wave propagation, show that the free space wave impedance is 377Ω by deriving necessary equation. (7M)

6. a) Explain the transmission line parameters and also obtain the transmission line equations. (7M)
   b) Define the term characteristic impedance and derive the expression for it. (7M)

7. a) Explain about Low loss radio frequency lines and UHF transmission lines in detail. (7M)
   b) What is Smith Chart? How it is used to find the impedance of transmission line? (7M)
~~~~~~