**Code No.PC408EC**

**METHODIST COLLEGE OF ENGINEERING & TECHNOLOGY**

**(An Autonomous Institution)**

**B.E. (ECE) IV-Semester (AICTE) Regular Examination, AUGUST-2023**

**Subject: ELECTRO MAGNETIC THEORY AND TRANSMISSION LINES**

**Time: 3 hours Max.Marks:60**

**Note: Missing data, if any, maybe suitably assumed.**

**PART-A**

**Answer All the questions. (10X2M=20M)**

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| --- | --- | --- | --- | --- |
| **Q.No.** | **Questions** | **Marks** | **CO** | **BTL** |
| **1. a** | Convert the point P (6,4,7) into spherical coordinate system | 2 | 1 | 2 |
| **b** | Define Conservative property and show that electrostatic field is conservative | 2 | 1 | 1 |
| **c** | State Biot-Savart’s law | 2 | 2 | 1 |
| **d** | In a material for which σ=5 S/m, ϵr=1 and the electric field intensity  = 250 sin 1010t V/m. Calculate the displacement current density | 2 | 2 | 2 |
| **e** | List the characteristics of Uniform plane wave | 2 | 3 | 1 |
| **f** | Calculate reflection coefficient of an electromagnetic wave impinging from free space to a dielectric medium with impedance 300 ohms when the wave incident with normal incidence θi=00. | 2 | 3 | 2 |
| **g** | Draw the equivalent circuit of a transmission line and define the primary constants. | 2 | 4 | 1 |
| **h** | Describe about Campbell’ formula | 2 | 4 | 1 |
| **i** | Write the expressions of input impedance of a infinite length transmission line and λ/4 length transmission line | 2 | 5 | 2 |
| **j** | When is a transmission line said to be perfectly matched to the load? | 2 | 5 | 1 |

**PART-B**

**Answer Any Five questions**. **(5X8M=40M)**

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| --- | --- | --- | --- | --- | --- |
| **Q.No** |  | **Questions** | **Marks** | **CO** | **BTL** |
| **2.** | **a** | Find the electric field intensity E on a point charge Q located at a distance ‘r’ units from the origin due to N no of point charges located at different distances rA, rB… rn units respectively from origin as shown in figure.  r  r D  r C  r B  r A  r n  QE  QD  QC  QB  QA  Q  =? | 4 | **1** | **3** |
| **b** | Estimate the electric field intensity due to infinite length coaxial cable at any point   1. Inside the inner cylinder 2. Between the inner and outer cylinders   Out side the outer cylinder | **4** | **1** | **3** |
| **3.** | **a** | Find the work done to move a point charge of 5 mC from point P(2,1,3) to point A(4,-2,5) in the electric field | **4** | **2** | **3** |
| **b** | Derive the boundary conditions between the two magnetic media interface | **4** | **2** | **2** |
| **4.** | **a** | What is the inconsistency of Ampere’s circuital law and how it is rectified and derive the modified Ampere’s Circuital law | **4** | **3** | **2** |
| **b** | A scalar potential in the certain region is given by V = . Find Electric field intensity E at point P(1,600,30) and determine D in free space | 4 | **3** |  |
| **5.** | **a** | Draw the impedance variations for the matched load, open circuited transmission line and short circuited transmission line | **4** | **4** | **2** |
| **b** | Starting with the differential equations for the elemental length of a uniform transmission line, Obtain the Expressions for sending end voltages and currents in terms of receiving end voltages and currents | **4** | **4** | **2** |
| **6.** | **a** | Explain the construction of Smith Chart with suitable examples | **4** | **5** | **3** |
| **b** | Explain the phenomenon of reflection and standing wave of a transmission line | **4** | **5** | **3** |
| **7.** | **a** | Derive Poissons and Laplace equation. | **4** | **1** | **2** |
| **b** | What are the different ways of finding the magnetic field intensity and express magnetic field in terms of current elements **,** Kds**,**  and magnetic vector potential . | **4** | **2** | **3** |
| **8.** | **a** | What are the advantages of wave equations? Derive wave equation for electric filed starting from Faraday’s law of electromagnetic induction in differential form | **4** | **3** | **3** |
| **b** | Explain the terms and relation ship between phase velocity and group velocity of a transmission line | **4** | **4** | **3** |
| **9.** | **a** | Estimate the characteristic impedance of a transmission line for (i) short load (ii) matched load (iii) open load | **4** | **5** | **2** |
| **b** | Explain how impedance matching can be achieved by using stub matching technique | **4** | **1** | **2** |

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