**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 $\vec{E}$= 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.rr Dr Cr Br Ar nQEQDQCQBQAQ$\vec{E}$=? | 4 | **1** | **3** |
| **b** | Estimate the electric field intensity due to infinite length coaxial cable at any point1. 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 $\vec{E}=4\hat{a\_{x}}+3x^{2}\hat{a\_{y}}+2yz^{2}\hat{a\_{z}}$ | **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 = $\frac{10 cosθsin∅}{r^{2}}$ . 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 $I\hat{dl}$**,** Kds**,** $\hat{J}dv$ and magnetic vector potential $\hat{A}$. | **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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