*R22 Regulation* *Subject code: 4E4DE*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

## B.Tech IV Semester Supplementary Examinations, December 2024

### ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

*(ECE)*

***Maximum Marks: 60*** Date:12.12.2024 Duration: 3 hours

**Note:** **1.This question paper contains two parts A and B.**
**2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.**
**3. Part B consists of 5 Units. Answer any one full question from each unit.**
**4. Each question carries 10 marks and may have a, b, c, d as sub questions.**

| | Part-A | CO | Bloom Tx |
|---|---|---|---|
| All the following questions carry equal marks (10x1M=10 Marks) | | | |
| 1.a) | Define Gauss's law. | CO1 | BL1 |
| b) | What is meant by dielectric breakdown? | CO1 | BL1 |
| c) | State ampere circuit law in integral form. | CO2 | BL1 |
| d) | Write down the Maxwell's Equations in their integral form. | CO2 | BL1 |
| e) | Define skin depth. | CO3 | BL1 |
| f) | Explain the Total Internal Reflection | CO3 | BL2 |
| g) | Sketch lossy transmission line, listing out its primary and secondary constants. | CO4 | BL2 |
| h) | What are the advantages and disadvantages of continuous loading? | CO4 | BL2 |
| i) | Define reflection coefficient and VSWR. | CO5 | BL1 |
| j) | Solve the maximum and minimum input impedances of a line with characteristic impedance of 100 ohms and Standing wave ratio S is 3. | CO5 | BL2 |
| | Part-B | | |
| Answer All the following questions. (5X10M=50Marks) | | | Bloom Tx level |
| 2 | A) What are the types of Charge Distributions? Determine the Electric Field Intensity Due to infinite Surface Charge. [5M]<br>B) A Point Charge of 20ηc is Located at the Origin. Determine the Magnitude and Direction of the electric Field Intensity $\bar{E}$ at the Point (1,3,-4) [5M] | CO1 | BL3 |
| | OR | | |
| 3 | A capacitor consists of squared two metal plates each 100 cm side placed parallel and 2 mm apart. The space between the plates is filled with a dielectric having a relative permittivity of 3.5. A potential drop of 500 V is maintained between the plates. Evaluate (i) The capacitance, (ii) The charge of capacitor, (iii) The electric flux density, (iv) The potential gradient. [10M] | CO1 | BL4 |
| 4 | Explain about the any two applications of Ampere's Circuit law. [10M] | CO2 | BL2 |
| | OR | | |

| | | | |
|---|---|---|---|
| 5 | A) Explain Faraday's law of electromagnetic induction and derive the expression for Induces e.m.f. [5M]<br>B) Derive the Boundary conditions for fields. [5M] | CO2 | BL3 |
| 6 | A) What is polarization? What are the different types of polarization? [5M]<br>B) In a lossless dielectric for which $\eta = 60\pi$, $\mu_r = 1$, and $H = -0.1\cos(\omega t - z)\,\overline{a_x} + 0.5\sin(\omega t - z)\overline{a_y}\ A/m$, calculate $\varepsilon_r$, ω and $\bar{E}$. [5M] | CO3 | BL4 |
| | OR | | |
| 7 | State and prove Poynting theorem. What does pointing vector represents? [10M] | CO3 | BL4 |
| 8 | A) An air line has a characteristics impedance of 70Ω and phase constant of $3\ rad/m$ at $100MHz$. Calculate R, C and L. [5M]<br>B) What is the characteristics impedance? Obtain the relation between characteristics impedance and the propagation constant. [5M] | CO4 | BL3 |
| | OR | | |
| 9 | A) Derive the Condition for Distortion Less Transmission Line. [5M]<br>B) Measurements on a Transmission Line of length 120Km were made at frequency of 6000Hz. If $Z_{OC} = 520$(-30deg) and $Z_{sc} = 640$(43deg) find $Z_o$ and P. [5M] | CO4 | BL4 |
| 10 | A transmission line of length $0.40\lambda$ has a characteristics impedance of $100\Omega$ and is terminated in a load impedance of $200 + j180\omega$. Find the [10M]<br>i. Voltage reflection coefficient<br>ii. Voltage standing wave ratio<br>iii. Input impedance of the line. | CO5 | BL4 |
| | OR | | |
| 11 | A) Explain the principle of single stub matching. [5M]<br>B) Write short notes on Smith Chart. [5M] | CO5 | BL3 |