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Code: 4G344

II B.Tech. II Semester Supplementary Examinations February 2022

**Field Theory and Transmission Lines**

(Electronics and Communication Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit (5x14 = 70 Marks )

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- |   | Marks |
|---|-------|
| <b>UNIT-I</b>   |       |
| 1. a) State and explain Coulomb's law? Obtain an expression of it in vector form.   | 7M    |
| b) Point charges 1mC and -2mC are located at (3, 2, -1) and (-1, -1, 4) respectively. Calculate the electric force on a 10nC charge locate at (0, 3, 1) and the electric field intensity at that point.   | 7M    |
| <b>OR</b>   |       |
| 2. a) State and Prove Gauss's law and Derive D and E due to infinite line charge.   | 7M    |
| b) Define Electric field intensity? Derive Electric field intensity for surface charge.   | 7M    |
| <b>UNIT-II</b>  |       |
| 3. a) Define current and current density? Differentiate convection and conduction currents.   | 7M    |
| b) Discuss the properties of dielectric materials.  | 7M    |
| <b>OR</b>   |       |
| 4. a) Write a short note on the following i) dielectric constant and dielectric strength<br>ii) Polarization.   | 7M    |
| b) Explain the procedure to find the Resistance and capacitance for non-uniform cross section of the conductor.   | 7M    |
| <b>UNIT-III</b>   |       |
| 5. a) Analogy between Electric and Magnetic field?  | 7M    |
| b) Write a short note on the following i) magnetic flux ii) magnetic flux density, iii) Magnetic field intensity or (strength)  | 7M    |
| <b>OR</b>   |       |
| 6. a) With neat diagram explain Biot Savarts law and write H equations for three current distributions.   | 7M    |
| b) Planes z=0 and z=4 carry current $K=-10a_x$ A/m and $K=10a_x$ A/m, respectively Determine H at (i) (1,1,1) (ii) (0,-3,10)  | 7M    |
| <b>UNIT-IV</b>  |       |
| 7. a) Write a short note on the following i) wave length ii) skin depth iii) propagation constant iv) intrinsic impedance.  | 7M    |
| b) Explain the waves in general.  | 7M    |
| <b>OR</b>   |       |
| 8. a) Derive an expression for reflection coefficient and transmission coefficient when a plane wave is incident normally on an interface between two different media.  | 7M    |
| b) In free space (z > 0), a plane wave with $H_i=10 \cos(10^8t - z)a_x$ mA/m. is incident normally on a lossless medium ( $\epsilon=2\epsilon_0$ , $\mu=8\mu_0$ ) in region z < 0). Determine the reflected wave $H_r$ , $E_r$ and the transmitted wave $E_t$ , $H_t$ . | 7M    |
| <b>UNIT-V</b>   |       |
| 9. a) Define with mathematical equations of the following : i) characteristic impedance ii) attenuation constant iii) velocity of propagation iv) wave length   | 7M    |
| b) Draw and explain about standing waves in OC and SC lines.  | 7M    |
| <b>OR</b>   |       |
| 10. a) Derive the transmission line equation  | 7M    |
| b) Discuss about the Reflection coefficient with relevant expressions.  | 7M    |

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