**20EC403**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular\Supplementary) DEGREE EXAMINATION** | | | |
| **July/August, 2023** | **Electronics and Communication Engineering** | | |
| **Fourth Semester** | **EM waves and Transmission Lines** | | |
| **Time:** Three Hours | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | **(4X14=56 Marks)** |
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|  |  |  | CO | BL | M |
| 1 | a) | Compare reflection and refraction of plane waves in any medium | CO1 | L3 | 1M |
|  | b) | What is perpendicular polarization | CO1 | L1 | 1M |
|  | c) | Recall Snell’s law of refraction | CO1 | L1 | 1M |
|  | d) | For perfect match  is \_\_\_\_\_\_\_\_\_ and the return loss is \_\_\_\_\_\_\_ | CO2 | L2 | 1M |
|  | e) | Define critical angle. | CO2 | L2 | 1M |
|  | f) | Find out the attenuation for lossless transmission line. | CO2 | L2 | 1M |
|  | g) | Write the Helmholtz equation. | CO3 | L1 | 1M |
|  | h) | What is the dominant mode for the TM waves in the rectangular waveguide? | CO3 | L1 | 1M |
|  | i) | What are degenerate modes in a rectangular waveguide | CO3 | L2 | 1M |
|  | j) | What is dominant mode? | CO3 | L2 | 1M |
|  | k) | Which mode in a circular waveguide has attenuation effect decreasing with increase in frequency? | CO4 | L2 | 1M |
|  | l) | What is the cutoff frequency for mode in a circular guide. | CO4 | L2 | 1M |
|  | m) | Mention the dominant modes in circular waveguide. | CO4 | L1 | 1M |
|  | n) | Mention the Helmholtz equation for *Ez* in a circular waveguide. | CO4 | L2 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Show that, when a given uniform plane wave is incident normally on a good conductor, the linear current density Js is essentially independent of the conductivity (σ). | CO1 | L3 | 7M |
|  | b) | Derive the reflection of a plane wave by a perfect Dielectric at normal incidence. | CO1 | L3 | 7M |
|  |  | **(OR)** |  |  |  |
| 3 | a) | Derive the conditions for reflection by a perfect insulator-oblique incidence for perpendicular polarization. | CO1 | L3 | 7M |
|  | b) | Explain the reflection of a plane wave by a perfect insulator at oblique incidence for parallel polarization. | CO1 | L3 | 7M |
| **Unit-II** | | | | | |
| 4 | a) | In a transmission line the VSWR is given as 2.5. The characteristic impedance is 50Ω and the line is to transmit a power of 25 watts. Compute the magnitudes of the maximum and the minimum voltage and current. Also determine the magnitude of the receiving end voltage when load is (100-j80) Ω | CO2 | L3 | 7M |
|  | b) | What are the properties and applications of smith chart? | CO2 | L2 | 7M |
| **(OR)** | | | | | |
| 5 | a) | Derive the reflection coefficient in terms of load impedance | CO2 | L2 | 7M |
|  | b) | A transmission line has the propagation constant and characteristic impedance of . The line is terminated in an impedance of Find the impedance at a distance of 1.5 m from the load | CO2 | L3 | 7M |
| **Unit-III** | | | | | |
| 6 | a) | Derive the field equations for the electric and magnetic fields for TMmn mode in rectangular wave guide? | CO3 | L3 | 7M |
|  | b) | When TE10 mode is propagated through a standard rectangular wave guide, the guide wave length measured is 8cm and when TE11 mode is propagated, the guide wave length is increased to 12cm. If the operating frequency for both the modes is 6 GHz. Calculate “a” and “b” for the guide? | CO3 | L3 | 7M |
| **(OR)** | | | | | |
| 7 | a) | Derive electric and magnetic field components for TEmn modes in rectangular waveguide. | CO3 | L3 | 7 M |
|  | b) | A TE10 mode is propagated through a wave guide with a = 10cm at a frequency 2.5 GHz, Find λc, Vp, Vg, λg, Zg and βg. | CO3 | L3 | 7 M |
| **Unit-IV** | | | | | |
| 8 | a) | Derive the field equations for the electric and magnetic fields for TMmn mode in Circular wave guide? | CO4 | L3 | 7M |
|  | b) | Analyse the solutions of wave equations in cylindrical coordinates. | CO4 | L3 | 7M |
| **(OR)** | | | | | |
| 9 | a) | List out the various characteristics of standard circular waveguides | CO4 | L2 | 7M |
|  | b) | Find the related expressions for not propagation of TEM waves in hallow waveguides. | CO4 | L3 | 7M |

