Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec– 2017**

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| **Code :** | **14EC2007** | **Duration :** | **3hrs** |
| **Sub. Name :** | **TRANSMISSION LINES AND WAVEGUIDES** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** | |
| 1. | a. | A transmission Line 100 km long has, α=0.00497N/km, β=0.0352 rad/km at 1000 Hz. The line is terminated with ZR=(2000+j0) Ω and is supported by a generator with an emf of 10V r.m.s and R­in=700Ω. Calculate the values of Is, Zs and IR, ER, Ps and PR. | CO1 | | 15 |
| b. | Enumerate the physical significance of a transmission line. | CO1 | | 5 |
| (OR) | | | | | |
| 2. | a. | Describe waveform distortion in the transmission line. Illustrate the types of distortion with examples. | CO1 | | 8 |
| b. | Derive the attenuation and phase shift constant in telephone cable. Discuss why the distortion effect is severe in telephone cable. | CO1 | | 12 |
|  |  |  |  | |  |
| 3. | a. | Derive the input impedance of a half wave line, the quarter wave line and discuss its applications. | CO2 | | 12 |
|  | b. | With the basic assumptions of a zero dissipation line and enumerate it’s line constants. | CO2 | | 8 |
| (OR) | | | | | |
| 4. |  | A transmission line of length 0.15λ has a characteristic impedance of 300 Ώ and terminated in a load ZL = 150+j150 Ώ. Find the following using smith chart.  i. VSWR ii. Reflection coefficient at load and source points iii. Load admittance iv. Input impedance v. Position of the first voltage minimum and maximum of the load. vi.Source admittance | CO2 | | 20 |
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| 5. | a. | The separation between the parallel plates of a waveguide is 3 cm. It is filled with a dielectric with relative permittivity of 4. The signal frequency is 6GHz. Find all propagating modes. For each of the propagating modes calculate the following:  i. Cut off frequency ii. Cut off wavelength | CO3 | | 12 |
|  | b. | Derive the attenuation factor of a TEM mode in a parallel plate waveguide | CO3 | | 8 |
| (OR) | | | | | |
| 6. |  | Derive the electric and magnetic field components from Maxwell’s equation, assuming the wave propagation is along the z-direction in a parallel plate waveguide structure. | CO3 | | 20 |
|  |  |  |  | |  |
| 7. |  | Formulate the electric and magnetic field components of a rectangular waveguide using Maxwell’s curl equations. | CO3 | | 20 |
| (OR) | | | | | |
| 8. | a. | A X-band waveguide with dimensions 2.286×1.016 cm has a cut off frequency of 6.56 GHz for the dominant mode. Calculate the phase and group velocities at 8, 10 and 12 GHz. | CO3 | | 10 |
|  | b. | Explain why a TEM mode does not exist in a rectangular waveguide? | CO3 | | 3 |
|  | c. | Construct circular waveguides with different modes of excitation. | CO3 | | 7 |
|  | |  |  | |  |
|  | | **Compulsory**: |  | |  |
| 9. |  | Discuss about the following transmission lines and analyze its significance:  i. Rectangular cavity resonator ii. Microstrip Lines iii. Coplanar Lines iv. Slot Lines | CO3 | | 20 |

ALL THE BEST