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 – April / May – 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. |  | Obtain the general solution of a transmission line in trigonometric form using differential circuit equations and discuss about its physical significance. | CO1 | 20 |
| (OR) | | | | |
| 2. | a. | Derive the characteristic impedance of a single T section of a transmission line. Also find out the impedance when the line is short circuited and open circuited. | CO1 | 12 |
| b. | A line with zero dissipation has R= 0.6 ohms, L=2.5 micro henry, and C=4.5 pF/m if the line is operated at 100 MHz, find its resistive impedance, propagation constant, velocity and wave length. | CO1 | 8 |
| 3. | a. | Calculate the standing wave ratio and reflection coefficient on a line having characteristic impedance Z0 = 300 Ω and terminated in ZR = (300 +j400) Ω. | CO2 | 6 |
|  | b. | Derive the input impedance of a half wave line and quarter wave line and discuss its applications. | CO2 | 14 |
| (OR) | | | | |
| 4. |  | A transmission line has a characteristic impedance of 300Ω and terminated in a load 150 +j150 Ω. Find the following:  (i) VSWR  (ii) Reflection coefficient  (iii)Input impedance at a distance of 0.001λ from the load  (iv) Position of first voltage minimum from the load | CO2 | 20 |
| 5. |  | Derive the general equations of electric and magnetic waves between two perfect parallel plane conductors. | CO2 | 20 |
| (OR) | | | | |
| 6. | a. | A pair of perfectly conducting planes is separated by 8 cm in air. For a frequency of 5GHz with TM10 mode excited, find the following:  (a) Cut off frequency  (b) Characteristic impedance  (c) Phase constant  (d) Phase and group velocity  (e) Guide wavelength | CO2 | 15 |
|  | b. | List the properties of a TEM mode. Calculate the cut off frequency and cut off wavelength of such TEM mode in a parallel plate waveguide with plate separation of 3 cm and operating at 4 GHz. | CO2 | 5 |
| 7. |  | Derive the general solution equations of a rectangular waveguide. | CO2 | 20 |
| (OR) | | | | |
| 8. | a. | Calculate the cut off frequencies, cut off wavelength and guide wavelength for rectangular waveguide with the following inner dimensions. These operate in the dominant TE10 mode.  (1) 7.214 x 3.404 cm(S-band)  (2) 2.286 x 1.106 cm(X-band) | CO2 | 12 |

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|  | b. | Sketch the field distribution of the dominant TE mode in a rectangular waveguide. | CO2 | 8 |
|  | | **Compulsory:** |  |  |
| 9. |  | Write Short notes about:  [i] Strip Lines and Microstrip Lines  [ii] Fin Line  [iii] Coplanar Waveguides  [iv] Circular waveguides | CO2 | 20 |