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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Sixth Semester, B.E. - Electronics and Communication Engineering

Semester End Examination; May / June - 2019

Microwave and Antennas

Time: 3 hrs

Max. Marks: 100

Note: Answer **FIVE** full questions, selecting **ONE** full question from each unit.

UNIT - I

- 1 a. A telephone line has $R = 6 \Omega/\text{km}$, $L = 2.2 \text{ mh/km}$, $C = 0.005 \mu\text{f/km}$ and $G = 0.05 \mu\text{mho/km}$. Determine Z_0 , α , β at 1 kHz. If the line length is 100 km. Determine the attenuation and phase shift of the signal. Calculate the phase velocity of the signal. 10
- b. Write a note on Reflection and Transmission coefficients. 5
- c. A 50Ω lossless line connects a signal of 100 kHz to a load of 100Ω . The load power is 100 mW. Calculate; 5
- i) Voltage reflection coefficient ii) VSWR iii) Position of 1st V_{\min} and V_{\max}
- 2 a. Describe why MMIC's are superior than hybrid MICs? Differentiate advantages and limitations of it. 8
- b. List the types of MIC's and describe any one of it. 12

UNIT - II

- 3 a. Describe the losses in terms of S-parameters in microwave devices and explain phase shift property of S-parameters. 10
- b. Explain E-plane tee and H-plane tee with neat diagram. 10
- 4 a. A magic-T is terminated at collinear ports 1 and 2 and difference port 4 by impedances of reflection coefficients $T_1 = 0.5$, $T_2 = 0.6$ and $T_4 = 0.8$ respectively. If 1 W power is fed at sum port 3. Calculate the power reflected at port 3 and power transmitted to other three ports. 10
- b. Sketch two-way power divider circuit. 4
- c. Explain working of Non-reciprocal phase shifter. 6

UNIT - III

- 5 a. Illustrate constructional details and modes of operation of GUNN Diode. 10
- b. Name the types of ATTD devices and briefly explain operation of IMPATT diode. 10
- 6 a. Describe FMCW radar with neat block diagram and waveforms. 8
- b. Write a short note on :
- i) Fading Mechanisms i 12
- ii) Ground stations
- iii) Transponder

UNIT - IV

- 7 a. Define the following parameters of the antenna :
- i) Radiation Pattern 10
 - ii) Beam area and directivity
 - iii) FNBW and HPBW
- b. Derive the Friss transmission formula with neat diagram and also find the power delivered to the receiver, if a radio link from PESCE to Mandya city railway station has a 15 W transmitter connected to an antenna of 2.5 m^2 effective aperture of 5 GHz. The receiving antenna has an effective aperture of 0.5 m^2 . Assume distance between them is 15 km. LOS, lossless, matched antenna. 10
- 8 a. Show that radiation resistance of $\lambda/2$ antenna is 73Ω . 8
- b. Discuss the electric fields of a short dipole. 12

UNIT - V

- 9 a. Write a short note on :
- i) GPR 10
 - ii) Lens Antenna
- b. Discuss microwave antennas :
- i) Corner reflectors 10
 - ii) Ultra wide band antenna
- 10 a. Bring out the salient features of slot antennas and explain Batrinet's principle. 10
- b. Discuss Micro strip antennas in detail. 10

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