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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 - 2018

Microwave and Antennas

Time: 3 hrs *Max. Marks: 100*

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

UNIT - I

1a. Derive the relationship between SWR and reflection coefficient. 6

b. A 50 Ω loss less line connects a matched signal of 100 kHz to a load of 100 Ω. The load power is 100 mW. Calculate;

i) Voltage reflection coefficient of the load

ii) VSWR of the load. 8

iii) Position of the first V_{min} and V_{max}.

iv) Impedance at V_{min} and V_{max} and values of V_{max} and V_{min}

c. Explain different types of mismatch losses in transmission lines. 6

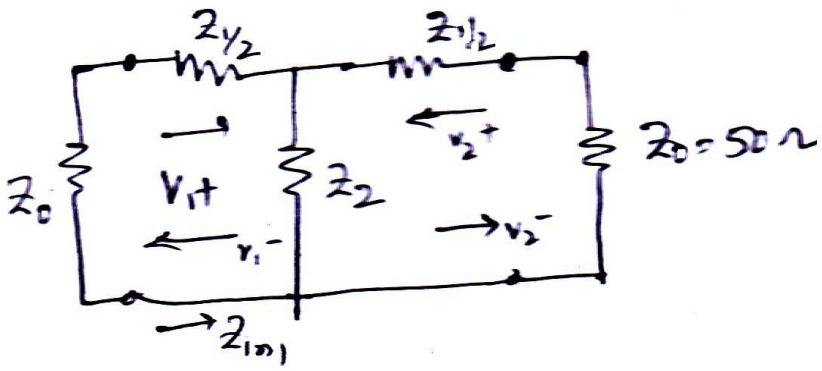
2a. Write a short note on micro strip lines. 6

b. Describe why MMIC'S are superior than hybrid MIC? Discuss relative advantages and disadvantages. 6

c. Determine the capacitance of an interdigitaled capacitor fabricated on a substrate of $\varepsilon_r = 13$ other parameters are n = 10, substrate height = 0.1 inch finger length = 0.001 inch, finger base width = 0.02 inch. 8

UNIT - II

3 a. Determine the S-matrix of a 3dB T-network attenuator shown below, terminated in a 50 Ω matched load with $Z_1 = 17.12\ \Omega$, $Z_2 = 141.78\ \Omega$.



6

b. With a neat block diagram, explain the working of reciprocal phase shifters. 8

c. Explain E-plane Tee and H-plane Tee. 6

Contd…2

4 a. A 20 mW signal is fed into one of the collinear port 1 of a lossless H-plane T-junction. Calculate the power delivered through each port when other ports are terminated in matched load. 6

b. Discuss the working of precision type variable attenuator. 8

c. Discuss briefly about power dividers and combiners with neat diagram. 6

UNIT - III

5 a. What is GUNN effect? Explain with constructional details of a GUNN diode. 8

b. Explain the working of tunnel diode. 6

c. An IMPATT diode with nominal frequency 10 GHz has C_j = 0.5 pF, L_p = 0.5nH and C_p = 0.3 pF at break down bias of 80 V and bias current 80 mA. The RF peak current is 0.65 A for R_d = -2 Ω. Find; 6

i) Resonant frequency ii) The efficiency

6 a. Explain the industrial applications of microwaves. 10

b. Write a short note on FM Doppler Radar. 5

c. A 1 kW, 3 GHz radar uses single antenna with a gain of 30 dB. The receiver has noise B.W of 1 KHz and a noise factor of 5 dB. A target of echoing area of 10 m^2 at a range of 10 nautical miles is to be detected. Calculate the minimum S/N. 5

UNIT – IV

7 a. Write a short note on Antenna field zones. 6

b. Define the following : 8

i) Radiation intensity ii) Beam efficiency iii) directivity and Gain.

c. An antenna has a field pattern given by $E(\theta) = \cos\theta \cos 2\theta$ *for* $0 \le \theta \le 90°$.Find; 6

i) The HPBW ii)FNBW.

8 a. Derive the radiation resistance of a λ/2 dipole. 6

b. For a short dipole λ/15 long, find the efficiency radiation resistance if loss resistance is 1 Ω. Find also the effective aperture. 6

c. Derive an expression for the field components of a short dipole starting with expressions of electric potential and vector magnetic potential. 8

UNIT - V

9 a. Write a short note on : 10

i) Lens antennas ii) Turnstile antennas.

b. Write a short note on : 10

i) Embedded antennas ii) Antennas for ground penetrating radars.

10 a. Explain rectangular type horn antenna. Obtain the design equation for rectangular horn with length L and path length differences δ. 10

b. Write a short note on micro strip antennas. 10

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