

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER- II (Old course) • REMEDIAL EXAMINATION – SUMMER 2015

Subject Code: 1710411

Date: 18/05/2015

Subject Name: RF and Microwave Engineering

Time: 02:30 pm to 5:00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Consider a transmission line of length L , characterized by β and Z_0 connected to a load Z_L . Determine the input impedance (looking into the line), the standing wave ratio, and the power flow on the line. 07
- (b) A lossless transmission line with $Z_0 = 50 \Omega$ is 30 m long and operates at 2 MHz. The line is terminated with a load $Z_L = 60 + j40 \Omega$. If $\beta = 0.6\pi$ on the line, find (1) The reflection coefficient, (2) The standing wave ratio, (3) the input impedance using the smith chart. 07

- Q.2** (a) A rectangular waveguide with dimensions $a = 2.5$ cm, $b = 1$ cm is to operate below 15.1 GHz. How many TE and TM modes can the waveguide transmit if the guide is filled with a medium characterized by $\mu_r = 0$, $\epsilon_r = 4$, $\nu_r = 1$? Calculate the cutoff frequencies of the modes. 07
- (b) Derive all necessary field equations for TE mode in a rectangular waveguide. 07

OR

- (b) Derive all necessary field equations for TE modes in a circular waveguide. 07
- Q.3** (a) Find the S parameters of the 3 dB attenuator circuit shown in Figure 1. 07

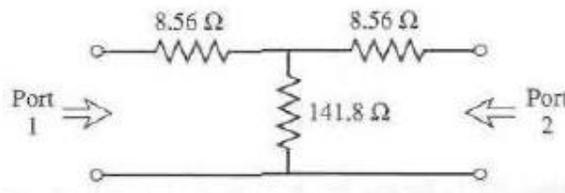


Figure 1. The 3 dB attenuator circuit.

- (b) Prove: For the reciprocal network, the $[s]$ matrix is symmetric and for the lossless network, the $[s]$ matrix is a unitary matrix. 07

OR

- Q.3** (a) Derive the ABCD parameters from the Z parameter of a two port network. If a network is reciprocal, show that $AD - BC = 1$. 07
- (b) Discuss various excitation methods to the waveguides. 07

- Q.4** (a) Derive the equation of quality factor Q for short-circuited $\lambda/2$ transmission line resonator. 07
- (b) Explain analysis of chebyshev multi-section matching transformer. 07

OR

- Q.4** (a) Explain in detail the T-junction power divider using the scattering matrix. 07
- (b) Explain the basic properties of ferromagnetic materials. 07

- Q.5** (a) Explain fully a balanced mixer in detail. 07
- (b) Explain noise in microwave system. 07

OR

- Q.5 (a)** Explain the basic principles of operation for one-port negative resistance oscillator. **07**
- (b)** Explain the monolithic microwave integrated circuits. **07**
