

GUJARAT TECHNOLOGICAL UNIVERSITY
ME - SEMESTER- II(Old course) • EXAMINATION (Remedial) – WINTER- 2015

Subject Code: 1710411**Date: 16/12/2015****Subject Name: RF and Microwave Engineering****Time: 2:30 pm to 5:00 pm****Total Marks: 70****Instructions:**

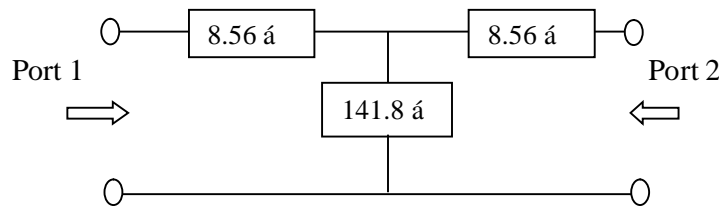
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) A load of $100 + j 150 \Omega$ is connected to a 75Ω lossless line. Find the following: Reflection coefficient, Standing wave ratio, The load admittance, Input impedance at 0.4λ from the load, Input impedance at the generator if the line is 0.6λ long. **07**
- (b) Explain multiple reflection analysis of the quarter-wave transformer with required expression. **07**

- Q.2** (a) Derive the general solutions for TE and TM waves. **07**
- (b) A rectangular waveguide with dimensions $a = 2.5 \text{ cm}$, $b = 1 \text{ cm}$ 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 $\epsilon_r = 0$, $\mu_r = 4$, $\mu_r = 1$? Calculate the cutoff frequencies of the modes. **07**

OR

- (b) Calculate the width and length of a microstrip line for a 50Ω characteristic impedance and a 90° phase shift at 2.5 GHz . The substrate thickness is $d = 0.127 \text{ cm}$, with dielectric constant of 2.20 . **07**
- Q.3** (a) Find the S parameters of the 3 dB attenuator circuit shown below. **07**



- (b) Explain the transmission (ABCD) matrix. Derive the ABCD parameters for a given the Z parameters of a two-port network. **07**

OR

- Q.3** (a) Explain single and double stub matching in details **07**
- (b) Derive the necessary equations of circular waveguide for TE mode **07**
- Q.4** (a) Derive the equations of quality factor (Q) for short-circuited $\lambda/4$ transmission line and open-circuited $\lambda/2$ transmission line. **07**
- (b) Explain quadrature hybrid directional coupler with even-odd analysis. **07**

OR

- Q.4** (a) Explain a rectangular waveguide cavity with necessary equations of resonant frequency, and Q of the TE_{10} mode. **07**
- (b) A lossless T-junction power divider has a source impedance of 50Ω . Find the output characteristics impedances so that the input power is divided in a 2:1 ratio. Compute the reflection coefficients seen looking into the output ports. **07**
- Q.5** (a) Explain the Wilkinson power divider in details. **07**

(b) Explain filter design by image parameter method. 07

OR

Q.5 (a) Explain ferrite phase shifter in details. 07

(b) Explain filter design by insertion loss method. 07
