

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014****Subject code: 1724101****Date: 16-06-2014****Subject Name: RF and Microwave Circuits****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
- 4.

- Q.1** (a) Define δ Nodes δ and δ Branches δ with ref. to SFG. With neat sketch explain how signal flow graph can be reduced to single branch using δ Decomposition Rules δ . **07**
- (b) Define: Scattering Matrix. Explain Scattering Matrix with necessary derivation **07**
- Q.2** (a) Draw Short piece of line with length ΔZ as a Lumped element circuit. Prove that for a Lossless line Phase Velocity is : $V_p = \frac{1}{\sqrt{LC}}$ **07**
- (b) Draw the Geometry of Rectangular Waveguide and Prove that Lowest f_c occurs for TE_{10} Mode is : $f_{c_{10}} = \frac{1}{2a\sqrt{\mu\epsilon}}$ **07**
- OR**
- (b) (I) Consider a length of air filled copper X-Band waveguide, with dimension $a = 2.286\text{cm}$ and $b = 1.016\text{cm}$. Find the cutoff frequencies of the first Four Propagating Modes. **07**
- (II) Write Short Note on : MICROSTRIP
- Q.3** (a) With neat Sketch and necessary equations explain δ Short Circuited $l/2\delta$ and δ Open Circuited $l/2\delta$ Transmission Line Resonators. **07**
- (b) Define: δ T-Junction Power Divider δ . With neat Sketch and necessary equations explain δ Resistive Divider δ . Mention its limitations. **07**
- OR**
- Q.3** (a) Define: δ Resonance Isolator δ . Explain Resonance Isolator with E-Plane and S-Plane Slab. **07**
- (b) Write Short Note on : The QUADRATURE (90°) HYBRID **07**
- Q.4** (a) Define: δ Balanced Mixer δ ? With neat sketch and necessary equations explain δ Balanced Mixer δ . **07**
- (b) Explain δ Richard's Transformation for an Inductor to Short Circuited Stub and for a Capacitor to an open circuited stub. **07**
- OR**
- Q.4** (a) Explain δ Frequency Scaling δ for Low Pass Filter and Transformation to a High Pass response with necessary derivation and sketch. **07**
- (b) What is δ Microwave Integrated Circuit? Explain Monolithic Microwave Integrated Circuit with layout. **07**
- Q.5** (a) What is Microwave Oscillator? Explain δ One Port Negative Resistance Oscillator δ with necessary derivation and neat sketch. **07**
- (b) An earth station with a transmitter power of 120W, a frequency of 6 GHz, and an antenna gain of 42dB transmit to a satellite repeater. The receiver antenna on the satellite has a gain 31db, and the satellite is in a synchronous orbit 25900 Km above the earth. What is the received Power in dBm? **07**

- Q.5** (a) Explain Filter Design by Insertion Loss Method. **07**
(b) Write Short Note on: Smith Chart and its applications to RF and Microwave Engineering **07**
