## **GUJARAT TECHNOLOGICAL UNIVERSITY** M. E. - SEMESTER - II • EXAMINATION - SUMMER • 2014

Subject code: 1724101

**Subject Name: RF and Microwave Circuits** 

Time: 02:30 pm - 05:00 pm

**Instructions:** 

**Total Marks: 70** 

Date: 16-06-2014

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- 4.
- (a) Define õNodesö and õBranchesö with ref. to SFG. With neat sketch explain how 0.1 07 signal flow graph can be reduced to single branch using õDecomposition Rulesö.
  - (b) Define: Scattering Matrix. Explain Scattering Matrix with necessary derivation 07
- (a) Draw Short piece of line with length  $\Delta Z$  as a Lumped element circuit. Prove Q.2 07 that for a Lossless line Phase Velocity is  $V = -\frac{1}{2}$

that for a clossiess line Phase velocity is 
$$v_p = \frac{1}{\sqrt{LC}}$$

Draw the Geometry of Rectangular Waveguide and Prove that Lowest 07 **(b)**  $f_c$  occurs for  $TE_{10}$  Mode is :  $f_{c_{1,0}} = \frac{1}{2a\sqrt{\mu\varepsilon}}$ 

## OR

- **(b)** (I) Consider a length of air filled copper X-Band waveguide, with dimension 07 a = 2.286cm and b = 1.016cm. Find the cutoff frequencies of the first Four Propagating Modes.
  - Write Short Note on : MICROSTRIP (II)
- Q.3 (a) With neat Sketch and necessary equations explain õShort Circuited /2ö and 07 õOpen Circuited /2ö Transmission Line Resonators.
  - (b) Define: õT-Junction Power Dividerö. With neat Sketch and necessary equations 07 explain õResistive Dividerö. Mention its limitations.

## OR

- (a) Define: õResonance Isolatorö. Explain Resonance Isolator with E-Plane and S-**Q.3** 07 Plane Slab.
  - (b) Write Short Note on : The QUADRATURE  $(90^{\circ})$  HYBRID
- 0.4 (a) Define: õBalanced Mixerö? With neat sketch and necessary equations explain 07 õBalanced Mixerö.
  - (b) Explain õRichardøs Transformation for an Inductor to Short Circuited Stub and 07 for a Capacitor to an open circuited stub.

## OR

- (a) Explain õFrequency Scalingö for Low Pass Filter and Transformation to a High **Q.4** 07 Pass response with necessary derivation and sketch.
  - (b) What is õMicrowave Integrated Circuit? Explain Monolithic Microwave 07 Integrated Circuit with layout.
- (a) What is Microwave Oscillator? Explain õOne Port Negative Resistance Q.5 07 Oscillatorö with necessary derivation and neat sketch.
  - (b) An earth station with a transmitter power of 120W, a frequency of 6 GHz, and 07 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 õFilter Design by Insertion Loss Methodö.
  - (b) Write Short Note on: Smith Chart and its applications to õRF and Microwave 07 Engineering

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