Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER • 2014

Subject code: 1724101 **Date: 02-12-2014**

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.**

Q.1 (a)

1. A plane wave travelling along z-axis in dielectric medium with Ů = 2.55 has an electric field given by $E_y = E_0 \cos(\omega t - kz)$. The frequency is 2.4GHz and E_0 = 30 V/m. **04**

(a) Find out the wave impedance
(b) Find the phase velocity
(c) Find out wavelength

2. For a lossless transmission line has the following per unit length parameter L = 0.2µH/m , C = 300pF/m. Calculate the propagation constant and characteristic impedance of this line at 500MHz. **03**

(b) For a load impedance Z_l = 60-j80 Ý, design single stub (short circuit) shunt tuning network to match this load to 50Ý line. Assume that load is matched at 2GHz, and load consists of resistor and capacitor in series. Use smith chart to solve this problem. **07**

Q.2 (a) Consider a length of Teflon-filled copper K-band rectangular waveguide, having dimensions a = 1.07cm and b = 0.43cm. Find cutoff frequencies of the first five propagating modes. Operating frequency is 15GHz (For Teflon Ů = 2.08 and tangent loss $tan\delta$ = 0.0004) **07**

(b) Write short note on quarter wave transformer with reference to microwave engineering. **07**

OR

(b) State the limitations of transmission line theory **07**

Q.3 (a) Explain short circuit ∂/2 transmission line resonators. **07**

(b) Prove that it is impossible to construct three-port network that is lossless, reciprocal, and matched at all ports. **07**

OR

Q.3 (a) Write short note on Gap-Coupled microstrip resonator. **07**

(b) State the applications of signal flow graph and derive expressions for $ũ_{in}$ and $ũ_{out}$ of two port network with general source and load impedance using signal flow graph. **07**

Q.4 (a) List out various methods of microwave filter design and explain one of them. **07**

(b) Write short note on Wilkinson power divider. **07**

OR

Q.4	**(a)**	Describe various types of Filter transformations methods.	**07**
	(b)	Explain Directional Coupler.	**07**
Q.5	**(a)**	Explain transistor based microwave oscillator in detail.	**07**
	(b)	Write short note on Pulse RADAR system	**07**

OR

Q.5	**(a)**	List out various types of mixer circuits and explain one of them in detail	**07**
	(b)	List out characteristics requirement from conducting and substrate material used to design MMIC and discuss advantages of MMIC based circuits over discrete circuits.	**07**

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