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A – 2366

Reg. No. : .....

Name : .....

**Eighth Semester B.Tech. Degree Examination, April 2016  
(2008 Scheme)**

**08.825 : MICROWAVE DEVICES AND CIRCUITS (T)**

Time : 3 Hours

Max. Marks : 100

**PART – A**

Answer **all** questions.

1. A 2 port network is known to have the S-matrix.

$$[S] = \begin{bmatrix} 0.15 \angle 0^\circ & 0.85 \angle -45^\circ \\ 0.85 \angle 45^\circ & 0.2 \angle 0^\circ \end{bmatrix}$$

Determine whether network is reciprocal and lossless. If port two is shorted what is the return loss at port 1 ?

2. Which type of wave propagate through microstripline and why ?
3. Define insertion loss and return loss.
4. Find the frequency of IMPATT diode if carrier drift velocity =  $2.2 \times 10^5$  m/s and drift length region =  $5 \mu\text{m}$ .
5. List the application of TRAPATT, its advantages and disadvantages.
6. List the Kuroda's identity.
7. How switches can be classified based on the characteristics ?
8. Explain the need for discontinuities in microwave integrated circuits.
9. Calculate the width and length of microstrip line for  $Z_0 = 50 \Omega$  and  $90^\circ$  phase shift at 2.5 GHz. Substrate thickness  $d = 0.127$  cm with  $\epsilon_r = 2.2$ .
10. What are the various aspects for choosing physical dimension for microstrip applications ?



**(10x4=40 Marks)**

P.T.O.



## PART - B

Answer **any 2** questions from **each** Module, **each** question carries **10** marks.

## Module - 1

11. Find the equivalent voltages and currents for a  $TE_{10}$  mode in a rectangular waveguide.
12. Design L-section matching network to match a series RC load with impedance  $Z_L = 200 - j100\Omega$  to  $100\Omega$  line at frequency 500 MHz.
13. Explain the working of MESFET with structure.

## Module - 2

14. Explain the LSA mode of working of Gunn diode.
15. A transistor has the following S-parameters at 10 GHz with a  $50\Omega$  reference impedance  $S_{11} = 0.45 \angle 150^\circ$ ;  $S_{12} = 0.01 \angle -10^\circ$ ;  $S_{21} = 2.05 \angle 10^\circ$  and  $S_{22} = 0.4 \angle -150^\circ$ .  $Z_s = 20\Omega$  and  $Z_L = 30\Omega$ . Compute power gain, available gain and transducer power gain.
16. Design a transistor oscillator at 4 GHz using GaAsFET with 5 nH inductor in series with gate to increase instability. Choose a terminating network to match to a  $50\Omega$  load and an appropriate tuning network. S parameters of transistor ( $Z_0 = 50\Omega$ )  $S_{11} = 2.18 \angle -35^\circ$ ,  $S_{12} = 1.26 \angle 18^\circ$ ,  $S_{21} = 2.75 \angle 96^\circ$  and  $S_{22} = 0.52 \angle 155^\circ$ .

## Module - 3

17. Design a low pass composite filter with cutoff frequency 2 MHz and impedance  $75\Omega$ . Place the infinite attenuation pole at 2.05 MHz.
18. Write note on lumped and distributed elements in microwave circuits.
19. Write notes on resonators, attenuators and switches. **(6×10=60 Marks)**