Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (ECE-NEW)/SEM-8/EC-804E/2010

2010

MICROWAVE CIRCUITS & SYSTEMS

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) *ABCD* parameter of the circuit

———z———

———————

is

a) $\begin{matrix} 1 & 0 \\ 1 & 0 \end{matrix}$ b) $\begin{matrix} 1 & z \\ 0 & 1 \end{matrix}$ c) $\begin{matrix} 1 & 0 \\ 1 & 1 \end{matrix}$ d) $\begin{matrix} z & 1 \\ 0 & 1 \end{matrix}$.

ii) Microwave components are generally characterized by

a) *S* parameter b) *Z* parameter

c) *ABCD* parameter d) *h* parameter.

iii) Power of 1 W is

a) 30 dBm b) 60 dBm

c) 0 dBm d) 1 dBm.

iv) The transmission line is used as

a) Antenna b) Stub

c) Oscillator d) Filter.

v) If VSWR = 1, then reflection coefficient is

a) 0 b) 1

c) – 1 d) α.

vi) For increasing channel capacity always use

a) MIMO MATRIX *A*

b) Beamforming

c) MIMO MATRIX *B*

d) All of these.

vii) The dominant mode in a waveguide is characterized by

a) longest cut-off wavelength

b) shortest cut-off wavelength

c) infinite attenuation

d) zero attenuation.

viii) When the polarization of the receiving antenna is unknown, to ensure that it receives at least half the power (except in particular situation), the transmitted wave should be

a) horizontally polarization

b) vertically polarization

c) circularly polarization

d) elliptically polarization.

ix) Match **List 1** with **List 2** and select the correct answer from the codes given below :

	List 1		***List 2***
a)	Turnstile	1.	RADAR
b)	Yagi	2.	TV transmission
c)	Dish	3.	MW broadcasting
d)	Vertical mast	4.	TV reception.

Codes :

	a	***b***	***c***	***d***
a)	4	2	3	1
b)	2	4	3	1
c)	2	4	1	3
d)	4	2	1	3.

x) Microwave antenna aperture efficiency depends on

a) feed pattern

b) antenna aperture

c) surface losses

d) low side lobe level.

xi) The antenna most comonly used for TV broadcasting in the UHF band is

a) Turnstile antenna

b) Dipole antenna

c) Yagi antenna

d) Rhombic antenna.

xii) Fields are said to be circularly polarized if their magnitudes are

a) equal and they are in phase

b) equal and they differ in phase by ± 90°

c) unequal and they differ in phase by ± 90°

d) not equal but they are in phase.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Design a single section quarter wave matching transformer to match a 10 Ω load to a 50 Ω line at 3 GHz. Determine percentage bandwidth for which SWR ≤ 1·5.

3. Calculate the position and length of a short circuited stub designed to match a 200 Ω load to a transmission line whose Ch. Impedance is 300 Ω and operating frequency is 1 GHz.

4. Write down the steps for fiter design by insertion loss method.

5. a) What do you mean by periodic structures ?

   b) Write down the expression for block impedance. 2 + 3

6. a) What do you mean by Chebyshev polynomial ?

   d) Describe the design method of Chebyshev transformer. 1 + 4

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Write down the steps for binomial transformer design.

   b) Design a three-section binomial transformer to match a 50 Ω load to a 100 Ω line and calculate the BW for reflection coefficient 0·05. 10 + 5

8. a) Find out *S* parameter of four-port directional coupler.

   b) A lossless *T* junction power divider has a source impedance of 50 Ω. Find the output Ch. impedance so that the input power is divided in 2 : 1 ratio.

   c) Using Even and Odd mode analysis find out *S* parameter of Wilkinson power divider. 6 + 5 + 4

9. a) Define Smart antenna system.

   b) What is the relation between gain and efficiency of an antenna.

   c) Write down Friis transmission formula and prove it.

   7 + 3 + 5

10. a) Write down properties of *S* parameter.

    b) Establish the relation between *ABCD* parameter and *S* parameter.

    c) Consider two networks with individual *S* matrix S^A and S^B . Show that overall S_{21} of the cascade is $S_{21}^A \; S_{21}^B \; / \left(1 - S_{22}^A S_{11}^B \right)$. 3 + 6 + 6

11. Write short notes on any *three* of the following : 3 × 5

a) MIMO ANTENNA

b) Unknown impedance measurement

c) Kurodas identities

d) RFMEMS

e) Microwave oven

f) Applications of RFMEMS.