M.E EXTC (old) sem II. 18/11/14.

Microwave Devices and Amplifiers Design.

QP Code : 14751

(3 Hours) **[Total Marks : 100**

N.B : (1) Question **no. 1** is **compulsory**.
(2) Out of remaining questions, attempt any **four** questions.
(3) Assume suitable additional data if required.
(4) **Figures** to the **right** indicate **full** marks.

1. (a) Explain 1 dB compression. **5**
(b) Explain the properties of S-parameters. **5**
(c) Explain Stability circles and its importance in amplifer design. **5**
(d) Discuss microwave amplifiers versus microwave oscillators. **5**

2. (a) Find S parameters of 3 dB attenuator shown in Fig. 2 (A). **10**

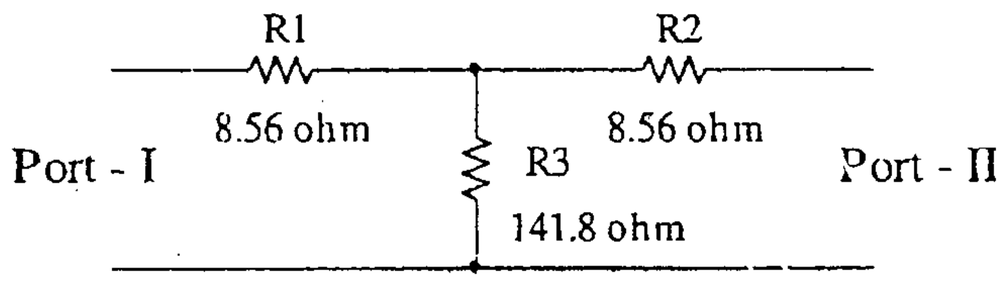

Fig. 2(A)

(b) Derive the tramsducer power gain as **10**

$$G_T = \frac{P_L}{P_{avs}} = \frac{|S_{21}|^2 (1-|\Gamma_S|^2)(1-|\Gamma_L|^2)}{|1-\Gamma_S\Gamma_{in}|^2 |1-S_{22}\Gamma_L|^2}.$$

3. (a) A BJT has the following S-parameters as a function of four frequencies. Detremine in which of these cases, device is unconditionally stable, and of these, which has the greatest stability. **10**

Frequency (MHz)	S_{11}	S_{12}	S_{21}	S_{22}
500	$0.70\angle -57^0$	$0.04\angle 47^0$	$10.5\angle 136^0$	$0.79\angle -33^0$
750	$0.56\angle -78^0$	$0.05\angle 33^0$	$8.6\angle 122^0$	$0.66\angle -42^0$
1000	$0.46\angle -97^0$	$0.06\angle 22^0$	$7.1\angle 112^0$	$0.57\angle -48^0$

(b) Define the figure of Merit in unilateral microwave amplifiers. If unilateral gain of the microwave amplifier is $U = \frac{|S_{11}\ S_{12}\ S_{21}\ S_{22}|}{|1-|S_{11}|^2||1-|S_{22}|^2|}$, show that $\frac{1}{(1+U)^2} < \frac{G_T}{G_{TU}} < \frac{1}{(1-U)^2}$, where GT is the transducer gain and GTU is the transducer gain in unilateral case. **10**

4. Design a transistor oscillator at 4GHz using FET ina common gate configuration. An inductor of value 5nH is placed in series with the gate to increase the stability. Choose a terminating network to match a 50Ω load, and an appropriate turning network. The S paramerters of the transistor in a common gate configuration are :- **20**

$S_{11} = 2.18\angle -35^0$, $S_{12} = 1.26\angle 18^0$, $S_{21}\angle = 2.75\angle 96^0$, and $S_{22} = 0.52\angle 155^0$.

5. A GaAs FET has the following scattering and noise parameters at 4 GHz, measured with a 50Ω system: **20**

$S_{11} = 0.6\angle -60^0$, $S_{22} = 0.5\angle -60^0$, $S_{12}\angle = 0.05\angle 25^0$, and $S_{21} = 1.9\angle 81^0$

$F_{min} = 1.6$dB, $R_N = 20\Omega$, and $\Gamma_{opt} = 0.62\angle 100^0$.

Assuming the FET to be unilateral, design an amplifier using open-circuited shunt stubs and transmission line lengths for a maximum possible gain and a noise figure no more than 2.0 dB. Estimate the error introduced in GT due to this assumption.

6. (a) For two port oscillator at steady state oscillation, prove that if : $\Gamma_L\Gamma_{in} = 1$ then $\Gamma_T\Gamma_{out} = 1$. **10**

(b) Explain any two measurement techniques of noise at microwave frequencies. **10**

7. Write a short note on any **two** of the following :— **20**

(a) Power distributed amplifiers

(b) Balanced FET mixers

(c) Microwave resonators.

ME (EXTC) Sem II 28/11/2014
Adv. Digital Comm

QP Code :14756

(old course)(Revised-2007)

(Duration : 3 Hours) Maximum Marks: 100

Note: i) Question no 1 is compulsory

ii) Solve any four out of remaining questions

iii) Figure to the right indicate full marks

Q.1 Attempt all questions.

	A	Miller codes	(05)
	B	Linear modulation with memory	(05)
	C	Lempel Ziv algorithm	(05)
	D	Nyquist criteria for band limited channels	(05)
Q.2	A	Describe the basic concept of ISI. Discuss design of band limited signal with controlled ISI.	(10)
	B	Compare source coding and channel coding. Explain the spectral waveform coding.	(10)
Q.3	A	What are adaptive equalizers? Explain with neat diagram using LMS algorithm.	(10)
	B	Explain decision feedback equalizer.	(10)
Q.4	A	Compare slow frequency hopping with fast frequency hopping. Draw the hopping pattern for each case.	(10)
	B	Explain synchronization in FHSS technique with neat diagram.	(10)
Q.5	A	The output of a DMS consist of letter x1, x2, x3 with probabilities 0.45, 0.35 and 0.20 respectively. Find out the efficiency using Huffman coding. If pairs of symbols are encoded using Huffman code find out efficiency. Comment on your result.	(10)
	B	Define the modified duo binary encoder. Derive and sketch the spectrum and impulse response. What are the advantages of the modified duo binary encoder?	(10)
Q.6	A	Give a detailed account of optimum receiver for CPM signals.	(10)
	B	Obtain the signal space representation of BPSK, QPSK and 8-PSK. Obtain the Euclidian distance and draw spectral efficiency for each.	(10)
Q.7		Write short notes on any two	(20)
	A	QAM and associated power constraints	
	B	Kalman algorithm	
	C	Decision feedback equalizer	

BB-Con.:8640-14.

M.E Sem II
Extc
SAT Com
Oct Nov 2014

QP Code :14753

(3 Hours) | Total Marks :100

N.B. : (1) Questions No. **1** is **compulsory**.
(2) **Solve** any four questions from **remaining**.
(3) Assume suitable **data** whenever **necessary**.

1. (a) Explain why 5m diameter antenna, as compared to 30m diameter antenna does not require tracking. 5
(b) What is 'Sun transit outage' ? Explain. 5
(c) Why is downlink $\left[\frac{C}{N}\right]$ is lower than uplink $\left[\frac{C}{N}\right]$ in a satellite communication system? 5
(d) State Keplar's law of planetary motion. 5

2. (a) With the help of a block diagram, explain telemetry, tracking and command system in a satellite communication system. **10**
(b) What are the various types of repeaters used in a satellite communication ? Explain any one in detail. **10**

3. (a) What do you understand by link budget. Explain the various losses incurred by the signal in a satellite communication. **10**
(b) Consider a satellite transmitting 20W at 4GHz through an antenna of gain of 20dB. An earth station at a distance of 36000 km receives the signal with the help of a receive antenna of 12 m diameter and antenna efficiency of 65%.Determine. **10**
(i) gain of earth station antenna
(ii) the path loss
(iii) the flux density at the earth station antenna
(iv) received power at the output of earth station antenna.

4. (a) What are the various types of antenna that can be used in satellite communication. Explain with the help of a diagram, working of any one antenna. **10**
(b) Explain synchronism of TDMA system. What is frame efficiency. **10**

5. (a) Explain how a satellite is placed in a geostationary orbit from earth. **10**
(b) With the help of a diagram describe the functioning of a transmit receive earth station used for telephone traffic. **10**

6. (a) Explain the major techniques of satellite attitude and orientation control. **10**
(b) Explain why does a satellite, orbit deviate from the prediction of kepler's law. How atmospheric drag and non-spherical earth affect the satellite orbit. **10**

7. (a) Write short notes on :– **20**
(a) Bath tub curve (b) VSAT network and applications
(c) Thermal control subsystem.
