Time: 3 hour **Max. Marks: 80**

Note:
1. Question No.1 is compulsory.
2. Attempt any three from the remaining questions.
3. Assume suitable data if applicable.
4. Figures on the right hand side indicate full marks.

Q1. Solve any four.

a) Draw one port oscillator circuit. Find value of R_L which maximizes Oscillator power. **5**
b) Explain phase noise and its effect on oscillator design. **5**
c) What is the image frequency in mixer? How to get rid of it? **5**
d) What is shielding? **5**
e) Explain scaling and conversion w. r. t. IL method of filter designing. **5**

Q2 A) Design the Butterworth high pass filter having cut-off frequency of 250 MHz And -15 dB response at 200 MHz. **10**
B) Give the significance of each section in Image parameter method of filter Design. **10**

Q3 A) Explain various methods of grounding. **10**
B) List and explain the power amplifier performance parameters. **10**

Q4 A) Silicon bipolar junction transistor has the following scattering parameters at 1 GHz **10**
$S_{11} = 0.38\angle -1580^0$, $S_{12} = 0.11\angle 54^0$, $S_{21} = 3.5\angle 80^0$, $S_{22} = 0.40\angle -43^0$
The source impedance Zs = 25Ω and load impedance Z_L = 40Ω. Compute the Power gain, the overall power gain and transducer power gain.
B) GaN HEMT has the following scattering parameters at 1.9 GHz (Zo = 50Ω) **10**
$S11 = 0.869\angle -1590^0$, $S12 = 0.031\angle -9^0$, $S21 = 4.25\angle 61^0$, $S22 = 0.507\angle -117^0$
Determine the stability of circle using K-Δ test and plot stability circles on smith chart.

Q5 A) Design a transistor oscillator at 4 GHz using GaAs MSFET in a common gate Configuration with 5 nH inductor in series with gate. **10**
$S_{11} = 0.72\angle -116^0$, $S_{12} = 0.03\angle 57^0$, $S_{21} = 2.6\angle 76^0$, $S_{22} = 0.73\angle -54^0$
Zo = 50Ω.
B) Derive and explain balanced diode mixer. **10**

Q6 A) What are the sources of EMI and its effect on EMI **10**
B) What is the need for EMC standards? Explain CISPR standards for EMC **10**

N	g_1	g_2	g_3	g_4	g_5	g_6	g_7	g_8	g_9	g_{10}	g_{11}
1	2.0000	1.0000									
2	1.4142	1.4142	1.0000								
3	1.0000	2.0000	1.0000	1.0000							
4	0.7654	1.8478	1.8478	0.7654	1.0000						
5	0.6180	1.6180	2.0000	1.6180	0.6180	1.0000					
6	0.5176	1.4142	1.9318	1.9318	1.4142	0.5176	1.0000				
7	0.4450	1.2470	1.8019	2.0000	1.8019	1.2470	0.4450	1.0000			
8	0.3902	1.1111	1.6629	1.9615	1.9615	1.6629	1.1111	0.3902	1.0000		
9	0.3473	1.0000	1.5321	1.8794	2.0000	1.8794	1.5321	1.0000	0.3473	1.0000	
10	0.3129	0.9080	1.4142	1.7820	1.9754	1.9754	1.7820	1.4142	0.9080	0.3129	1.0000

Source: Reprinted from G. L. Matthaei, L. Young, and E. M. T. Jones, *Microwave Filters, Impedance-Matching Networks, and Coupling Structures* (Dedham, Mass.: Artech House, 1980) with permission.

Table: Element values for maximally flat low pass filter g_0=1,ω_c=1, N=1 to 10

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