

Time: 3 Hour

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) State and discuss natural sources of EMI 5
- b) With neat circuit explain working of single ended diode mixer. 5
- c) Explain 1 dB compression in power amplifier designing 5
- d) State and explain the term Unilateral Figure of Merit 5
- e) Explain phase noise and its effect on oscillator design. 5

Q2: A) Design a maximally flat low-pass filter with a cut off frequency of 2 GHz, Impedance of 50 Ohm, and at least 15 dB insertion loss at 3 GHz. 10

TABLE 8.3 Element Values for Maximally Flat Low-Pass Filter Prototypes ($g_0 = 1, \omega_c = 1, N = 1$ to 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

B) Give the significance of each section in Image parameter method of filter Design 10

Q3: A) GaN HEMT has the following scattering parameters at 1.9 GHz ($Z_0 = 50\Omega$) 10

$$S_{11} = 0.869 \angle -159^\circ, S_{12} = 0.031 \angle -9^\circ, S_{21} = 4.25 \angle 61^\circ, S_{22} = 0.507 \angle -117^\circ$$

Determine the stability of the transistor by using K-Δ test and plot stability

Circle on Smith chart.

B) Using smith chart plot constant gain circles for $G_s = 2$ and 3 dB and $G_L = 0$ and 1dB. Values of scattering parameters are 10

$$S_{11} = 0.75 \angle -120^\circ, S_{12} = 0, S_{21} = 2.5 \angle 80^\circ, S_{22} = 0.60 \angle -70^\circ$$

Q4 : A) Design a transistor oscillator at 3 GHz using GaAs MSFET in a common gate Configuration with 3 nH inductor in series with gate. 10

$$S_{11} = 0.711 \angle -116^\circ, S_{12} = 0.02 \angle 57^\circ, S_{21} = 2.59 \angle 76^\circ, S_{22} = 0.725 \angle -54^\circ$$

$Z_o = 50\Omega.$

B) Discuss various performance criteria for mixer that can become part of mixer Design. 10

Q5: A) Explain various coupling modes in EMI 10

B) Give the details of CISPR and FCC standards. 10

Q6: A) Explain Kuroda's Identity and Richard's Transformation 10

B) Explain shielding and filtering methods of controlling EMI 10
