

Time: 3 Hrs

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.

Q.1 Answer any four

- (i) Explain the various grounding schemes in EMC with diagrams **05 Marks**
- (ii) Explain Scaling and conversion w. r. T. IL method of Filter designing **05 Marks**
- (iii) What is unilateral figure of merit? Explain its relevance with amplifier design **05 Marks**
- (iv) What are variable modulus dividers in Frequency Synthesizers? **05 Marks**
- (v) Explain 1 db compression in power amplifier designing **05 Marks**

Q.2 a) Give the significance of each section in Image parameter method of filter design

**10 Marks**b) Derive the expression for available power gain  $G_A$ **10 Marks**

Q.3 a) A GaAs MESFET is biased for minimum noise figure, with the following scattering parameters and noise parameters at 4 GHz ( $Z_0 = 50 \text{ ohms}$ ):  $S_{11} = 0.6 \angle -60^\circ$ ,  $S_{12} = 0.05 \angle 26^\circ$ ,  $S_{21} = 1.9 \angle 81^\circ$ ,  $S_{22} = 0.5 \angle -60^\circ$ ,  $F_{\min} = 1.6 \text{ dB}$ ,  $\Gamma_{\text{opt}} = 0.62 \angle 100^\circ$ , and  $R_N = 20 \Omega$ . For design purposes, assume the device is unilateral, and calculate the maximum error in  $GT$  resulting from this assumption. Then design an amplifier having a 2.0 dB noise figure with the maximum gain that is compatible with this noise figure. **10 Marks**

b) Compare various types of Diode and FET Mixers

**10 Marks**

Q.4 a) Explain various coupling modes in EMI

**10 Marks**

b) Design a Band pass filter having a 0.5 dB equal-ripple response, with  $N = 3$ . The centre frequency is 1 GHz, the bandwidth is 10%, and the impedance is 50 ohms. Refer the table attached for the coefficients.

**10 Marks**

$N$	0.5 dB Ripple										
	$g_1$	$g_2$	$g_3$	$g_4$	$g_5$	$g_6$	$g_7$	$g_8$	$g_9$	$g_{10}$	$g_{11}$
1	0.6986	1.0000									
2	1.4029	0.7071	1.9841								
3	1.5963	1.0967	1.5963	1.0000							
4	1.6703	1.1926	2.3661	0.8419	1.9841						
5	1.7058	1.2296	2.5408	1.2296	1.7058	1.0000					
6	1.7254	1.2479	2.6064	1.3137	2.4758	0.8696	1.9841				

Q.5 a) A GaN HEMT has the following scattering parameters at 1.9 GHz ( $Z_0 = 50 \Omega$ ):  $S_{11} = 0.869 \angle -159^\circ$ ,  $S_{12} = 0.031 \angle -9^\circ$ ,  $S_{21} = 4.250 \angle 61^\circ$ ,  $S_{22} = 0.507 \angle -117^\circ$ . Determine the stability of this transistor by using the  $K - \Delta$  test. Plot the stability circles on a Smith chart. **10 Marks**

b) Explain Bonding and Shielding in EMC

**10 Marks**

Q.6 Write a Short Note on Any two

**20 Marks**

a) CISPR and FCC standards

b) DDFS

c) Kuroda's Identity and Richard's Transformation

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