

ME-EXTC
Choice Based
23/05/17

3 Hours

Total Marks: 80

- N.B. : (1) Attempt any four question out of Six.
(2) Figures to the right indicate full marks.
(3) Assume suitable data wherever necessary and indicate the same.

- Q.1
(a) Draw and explain in detail Single-Ended Diode Mixer. [10]
- (b) Design a transistor oscillator at 4 GHz using a GaAs MESFET in a common gate configuration, with a 5 nH inductor in series with the gate to increase the stability. Choose a terminating network to match to a 50 Ω load, and an appropriate tuning network. The scattering parameters of the transistor in a common source configuration are ($Z_0 = 50 \Omega$) $S_{11}' = 2.18 \angle -35^\circ$, $S_{12}' = 1.26 \angle 18^\circ$, $S_{21}' = 2.75 \angle 96^\circ$, and $S_{22}' = 0.52 \angle -155^\circ$. [10]
- Q.2
(a) Explain Hybrid and Monolithic MIC by comparing the two MICs in the following areas Cost, size and weight, Design flexibility, Circuit tweaking and Reliability. [10]
- (b) Write a short note on Field Surveys. [10]
- Q.3
(a) Draw the block diagram and explain scalar, passive, fundamental-frequency load/source pull. [10]
- (b) The s parameters for the HP HFET-102 FET at 2 GHz, with a bias voltage $V_{gs}=0$ are given as follows ($Z_0=50\Omega$) [10]
 $S_{11} = 0.894 \angle -60.6^\circ$
 $S_{21} = 3.122 \angle 123.6^\circ$
 $S_{12} = 0.020 \angle 62.4^\circ$
 $S_{22} = 0.781 \angle -27.6^\circ$
 Determine the stability of this transistor by K- delta test and plot the stability circles on smith chart.
- Q.4
Design an amplifier to have a gain of 11 dB at 4.0 GHz. Plot constant-gain circle for $G_S = 2$ and 3 dB, and $G_L = 0$ and 1 dB. Calculate and plot the input return loss and overall amplifier gain from 3 to 5 GHz. The transistor has the following scattering parameters ($Z_0 = 50 \Omega$): [20]
- | f (GHz) | S11 | S12 | S21 | S22 |
|---------|--------------------------|-----|------------------------|-------------------------|
| 3 | $0.80 \angle -90^\circ$ | 0 | $2.8 \angle 100^\circ$ | $0.66 \angle -50^\circ$ |
| 4 | $0.75 \angle -120^\circ$ | 0 | $2.5 \angle 80^\circ$ | $0.60 \angle -70^\circ$ |
| 5 | $0.71 \angle -140^\circ$ | 0 | $2.3 \angle 60^\circ$ | $0.58 \angle -85^\circ$ |

Turn Over

- Q.5
- (a) Design an lumped impedance matching network using smith chart to match a load [10]
with an impedance $Z_L = 10 + j10 \Omega$ to a 50Ω line at a frequency of 1GHz.
- (b) How is Vector Network Analyzer used to measure periodic large signal waveform [10]
with all harmonics.
- Q.6 Write a short note on following [20]
- (a) Strip lines
(b) Image Frequency in Mixers
(c) Dielectric Resonator Oscillator
(d) Microstrip lines.