ME | sem II | EXTC | choice based | May June 2019

15/5/19

Paper / Subject Code: 34003 / RF & Microwave Engineering

(3 Hours) **Total Marks: 80**

N.B. : (1) Question number 1 is compulsory.
(2) Attempt any three questions from remaining questions.
(3) Figures to the right indicate full marks.
(4) Assume suitable data wherever necessary and indicate the same.

Q.1 Write a short note on following: [20]
(a) Hybrid MICs versus Monolithic MICs.
(b) Coupled Lines.
(c) Dielectric Resonator Oscillator.
(d) Noise correlation matrix.

Q.2 (a) For a load impedance $Z_L = 60 - j80\ \Omega$, design single-stub (short circuit) shunt tuning networks to match this load to a 50 Ω line. Assuming that the load is matched at 2 GHz. [10]
(b) Draw and explain in detail Single-Ended Diode Mixer. [10]

Q.3 (a) What is phase noise in oscillators? Give a mathematical analysis of phase noise. [10]
(b) How is Vector Network Analyzer used to measure periodic large signal waveform with all harmonics. [10]

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 ($Z0 = 50\ \Omega$): [20]

f(GHz)	S_{11}	S_{12}	S_{21}	S_{22}
3	$0.80\angle -90°$	0	$2.8\angle 100°$	$0.66\angle -50°$
4	$0.75\angle -120°$	0	$2.5\angle 80°$	$0.60\angle -70°$
5	$0.71\angle -140°$	0	$2.3\angle 60°$	$0.58\angle -85°$

Q.5 (a) 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 Ω) [10]

$S_{11} = 0.894\angle -60.6°$
$S_{21} = 3.122\angle 123.6°$
$S_{12} = 0.020\angle 62.4°$
$S_{22} = 0.781\angle -27.6°$

Determine the stability of this transistor by K- delta test and plot the stability circles on smith chart.
(b) Explain nonlinear measurements of microwave circuits with reference to load and source pull. [10]

Q.6 (a) Show that the reflection coefficient is larger than 1 for a load of negative resistance. Justify you answer using I2R relation. (10)
(b) Write a short note on Field Surveys. [10]
