1/12/2011 B.E (EXTC) VIII

Advance. Microwave. Engineering.

98: 2nd.Half-Exam.-11 mina (a).

Con. 6145-11. **(REVISED COURSE)** **MP-5290**

(3 Hours) **[Total Marks : 100**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) **Use** smith chart if **necessary**.
(4) **Figures** to **right** indicate **full** marks.

Q1 a. Find S- parameters of two port series network Z= 100Ω and Z_0=50Ω network [5]

b. Explain Large signal characterization with reference to load pull contours, how it is measured ? [5]

c. Define signal to noise ratio and noise figure with help of noisy microwave network. Explain test set up to measure signal to noise ratio. [5]

d. Explain with help of neat diagram , single balance mixer. [5]

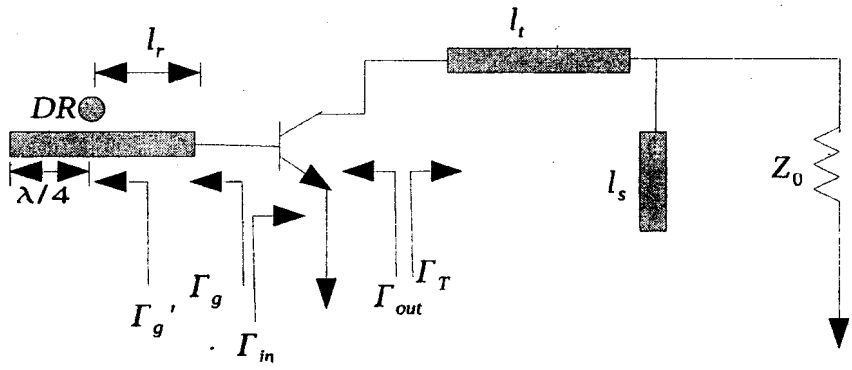
Q2 Design an amplifier for maximum gain at 4 GHz using single stub matching section. Calculate and plot the input return loss and gain from 3 to 5 GHz . Plot stability circles on smith chart. The GaAs FET has the following S parameters, Z_0=50Ω. [20]

f GHz	S_{11}	S_{21}	S_{12}	S_{22}
3	$0.80\angle -89^0$	$2.86\angle 99^0$	$0.03\angle 56^0$	$0.76\angle -41^0$
4	$0.72\angle -116^0$	$2.60\angle 76^0$	$0.03\angle 57^0$	$0.73\angle -54^0$
5	$0.66\angle -142^0$	$2.39\angle 54^0$	$0.03\angle 62^0$	$0.72\angle -68^0$

Q3 Design a dielectric resonator oscillator at 2.4 GHz using series feedback circuit of following figure, with bipolar transistor having following S parameters (Z_0=50Ω).

$$S_{11}=1.8\angle 130^0, S_{12}=0.4\angle 45^0, S_{21}=3.8\angle 36^0, S_{22}=0.7\angle -63^0$$

Determine the coupling coefficient for the dielectric resonator, and a microstrip matching network for the termination network. Plot $|\Gamma_{out}|$ v/s $\Delta f/f_0$, for small variation in frequency RLC about design value, assuming unloaded resonator Q of 1000. [20]



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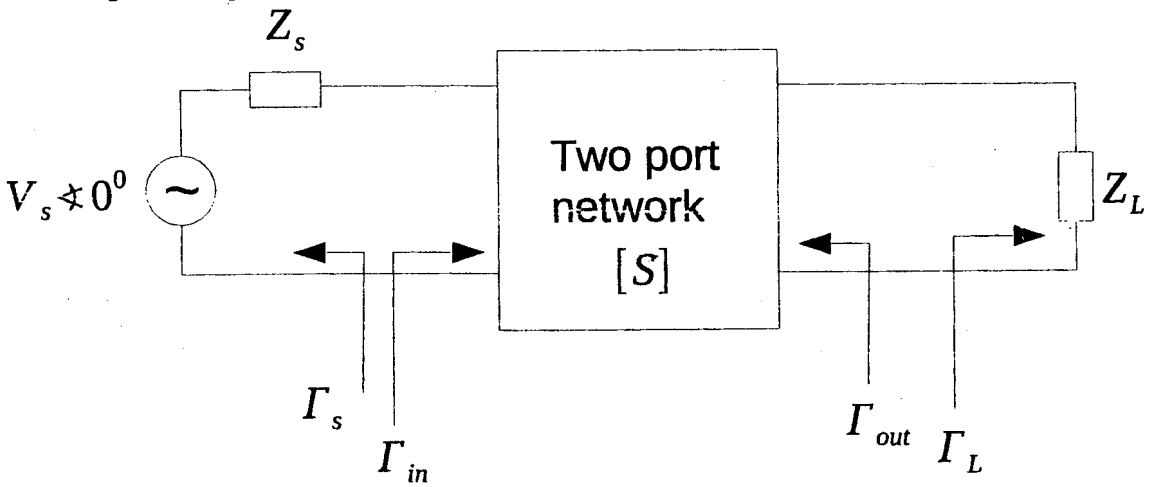
Q4 Design a class A power amplifier at 900 MHz using MRF858S NPN transistor with output power of 3 W. Design input and output impedance matching sections for the amplifier, find the required input power, and compute the power added efficiency. Use the given S parameters to compute source and load reflection coefficients for conjugate matching. The small signal S parameters of above transistor is given as below .

$S_{11}=0.940\angle 164^0, S_{12}=0.031\angle 59^0, S_{21}=1.222\angle 43^0, S_{22}=0.570\angle -165^0$

For an emitter collector voltage V_{CE}=24V, and collector current of I_C=0.5A, the output power at the 1dB compression point is 3.6W, and power gain is 12dB. The source and load impedances are $Z_{in}=1.2+j3.5\,\Omega$, $Z_{out}=9+j14.5\,\Omega$. [20]

Q5 a. Define conversion loss of SSB mixer, also explain diode loss, mismatch loss, harmonic loss. [10]

b. Find signal flow graph of microwave amplifier shown in figure. [10]



Q6 a. Describe and classify in detail generator tunning networks [10]

b. Explain in detail single ended diode mixer. What are mixer design considerations? [10]

Q7.Write short note on :

a. Characteristics of power amplifier [7]

b. Oscillator v/s amplifier design [7]

c. Broad band microwave amplifier using balance amplifier design technique [6]