

(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 $Z= 100\Omega$ and $Z_0=50\Omega$ 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]

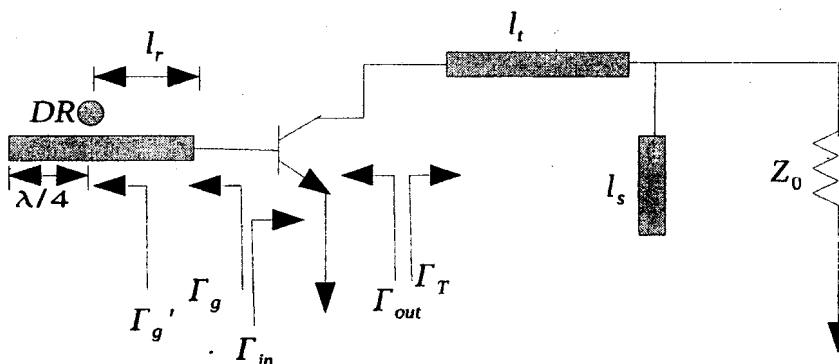
Q2 Design an amplifier for maximum gain at 4 GHz using single stub matching section. Calculate and plot the input return loss and gain from 3 to 5 GHz . Plot stability circles on smith chart. The GaAs FET has the following S parameters, $Z_0=50\Omega$. [20]

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

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

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

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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B. E. (EXTC) VIII.

Advance: Microwave Engineering.

99: 2nd Half-Exam.-11 mina (a).

Con. 6145-MP-5290-11.

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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 .

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

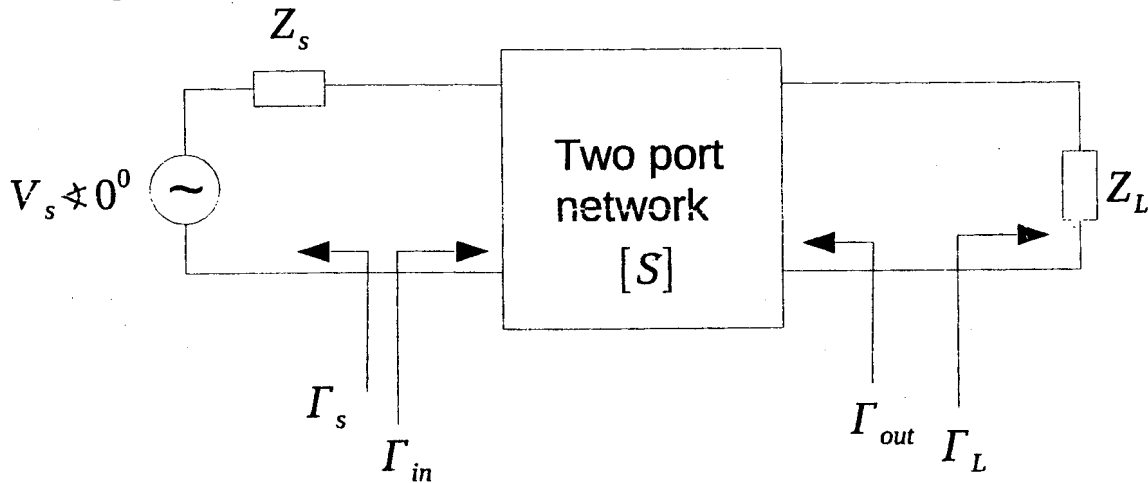
For an emitter collector voltage $V_{CE} = 24V$, and collector current of $I_C = 0.5A$, the output power at the 1dB compression point is 3.6W, and power gain is 12dB. The source and load impedances are

$$Z_{in} = 1.2 + j3.5 \Omega, Z_{out} = 9 + j14.5 \Omega \quad [20]$$

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 tuning 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]