

- N.B. (1) Question No. 1 is compulsory.
 (2) Attempt any four questions out of the remaining questions.
 (3) Use of Smith chart is compulsory.
 (4) Assume any data wherever required but justify the same.

1. (a) A certain MESFET is biased for large signal class A operation with the following small-signal s-parameters at 5 GHz. 20

$$S_{11} = 0.55 \angle -150^\circ \quad S_{21} = 3.5 \angle 170^\circ$$

$$S_{12} = 0.04 \angle 20^\circ \quad S_{22} = 0.45 \angle -30^\circ$$

The large signal forward transmission coefficient S_{21} , is measured to be $S_{21} = 2.8 \angle 180^\circ$. Design a large-signal class A amplifier with maximum transducer gain in a 50Ω system. Assume ± 0.5 dB error in gain is small enough to justify simplifications. What is the high power amplifier gain ?

- (b) Define dynamic range, 1dB compression and MDS.

2. A certain GaAs MESFET has following noise figure parameters measured at $V_{ds} = 5$ V, $I_{ds} = 20$ mA with a 50Ω resistance for frequency of 9 GHz. 20

$$F_{run} = 2 \text{ dB}$$

$$\tau_{opt} = 0.485 \angle 155^\circ$$

$$R_0 = 4 \Omega$$

Plot noise figure circles for given values of F at 2.5, 3.0 and 3.5 dB.

3. (a) Explain optimal loading used in HPA design in detail. 10
 (b) Define s-parameters and explain their use in microwave amplifier design in detail. 10

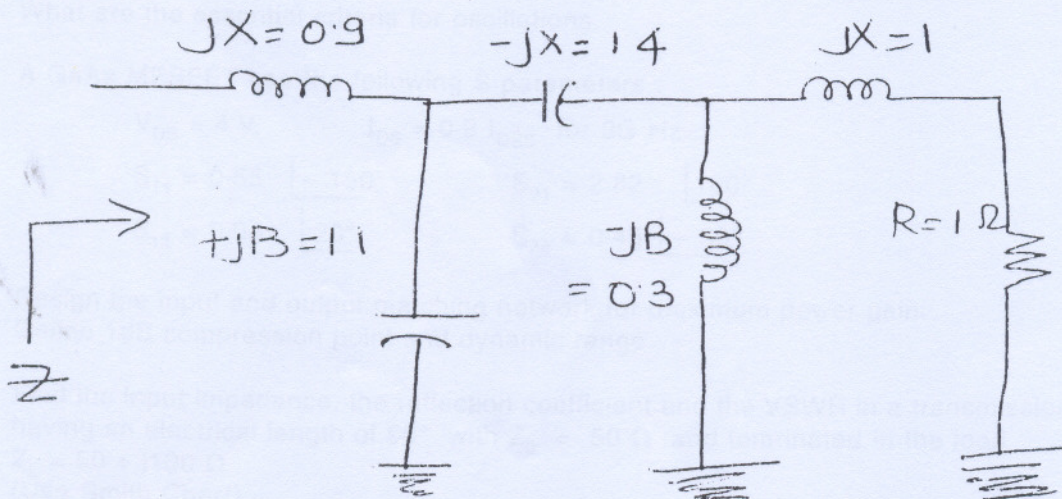
4. (a) Determine the stability of a GaAs FET that has the following s-parameters at 2 GHz in a 50Ω system both graphically and mathematically. 15

$$S_{11} = 0.86 \angle -57^\circ \quad S_{21} = 3 \angle 125^\circ$$

$$S_{12} = 0.018 \angle 61.5^\circ \quad S_{22} = 0.775 \angle -26^\circ$$

- (b) Explain the various criteria required to determine stability. 5

5. (a) In the figure given below, find the impedance looking into the network using Smith Chart. 10



- (b) What are Mixers ? Explain any one type of Mixer in detail. 10

6. A GaAs MESFET is measured to have the following s-parameters for a mid range Q-point where $V_{DS} = 5$ V, $I_D = 10$ mA at 10 GHz with 20

$$S_{11} = 0.53 \angle -152^\circ \quad S_{21} = 2.8 \angle 182^\circ$$

$$S_{12} = 0.04 \angle 20^\circ \quad S_{22} = 0.47 \angle 28^\circ$$

Using this Transistor design a Microwave amplifier for Maximum power gain at 10 GHz.