(3 Hrs) **Marks: 80**

1. Question No. 1 is compulsory
2. Out of remaining questions, attempt any three questions.
3. Assume suitable additional data if required and justify the same.
4. Figures in brackets on the right hand side indicate full marks.

Q.1 (a) Explain how MMICs are superior over HMICs. (05)
(b) What is Optimum Loading and describe the need of it for Microwave Amplifier. (05)
(c) What is compressed smith chart? How it is useful in microwave design? (05)
(d) What are coupled microstrip lines? Show their field distribution. (05)

Q.2 (a) Discuss various mixers topology. Compare performance of them. (10)
(b) For two port oscillator at steady state oscillation, prove that if: (10)
$\Gamma_L\Gamma_{in} = 1$ then $\Gamma_T\Gamma_{out} = 1$.

Q.3 (a) Derive the transducer power gain as (10)

$$G_T = \frac{P_L}{P_{AVG}} = \frac{1-|\tau_s|^2}{(1-S_{11}\tau_s)^2}\cdot|S_{21}|^2\cdot\frac{1-|\tau_L|^2}{(1-S_{22}\tau_L)^2}$$

(b) What is an HMIC? Describe the key processing techniques of fabricating HMICs. (10)

Q.4. Design a transistor oscillator at 4 GHz using GaAs FET in a common gate configuration, with a 5 nH inductor in series with the gate to increase the instability. Choose a terminating network to match to a 50 ohms load and an appropriate tuning network. The S parameters of the transistor in a common gate configuration are (Z_0=50 ohms) S_{11}=2.18∠-35^o, S_{21}=2.75∠96^0, S_{12}=1.26∠-18^0, S_{22}=0.52∠155^0. (20)

Q.5 (a) Discuss microwave amplifier versus microwave oscillators. (10)
(b) State and Explain the important design considerations of coplanar wave guides. (10)

Q.6 Write short notes on: (20)
(a) Green's function
(b) Thick film technology
(c) Balanced FET mixers

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