(3 Hours)   **Max 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) Compare MMIC with HMIC.   (05)
     (B) What is Optimum Loading and describe the need of it for Microwave (05)
         Amplifier.
     (C) How coupled line parameters vary with frequency?   (05)
     (D) List and explain various performance parameters of mixer.   (05)

Q.2. (A) Explain using suitable diagrams two methods of designing broadband (08)
         amplifier.
     (B) A BJT has the following *S*-parameters as a function of three frequencies. (12)
         Determine in which of these cases, device is unconditionally stable and
         which has greatest stability.

Freq. (MHz)	S_{11}	S_{12}	S_{21}	S_{22}
500	$0.70 \angle -57°$	$0.04 \angle 47°$	$10.5 \angle 136°$	$0.79 \angle -33°$
750	$0.56 \angle -78°$	$0.05 \angle 33°$	$8.6 \angle 122°$	$0.66 \angle -42°$
1000	$0.96 \angle -97°$	$0.06 \angle 22°$	$7.1 \angle 112°$	$0.57 \angle -48°$

Q.3. (A) Explain Green's Function and discuss its application.   (10)
     (B) Derive the transducer power gain as,   (10)

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

Q.4.   Design a class A power amplifier at 900 MHz using mRF-8585 NPN (20)
         transistor with output power of 3 W. Design input and output impedance
         matching section for amplifier. Find the required input power and compute
         the power added efficiency. Use the given S-parameter to compute source
         and load reflection coefficient.

Q.5. (A) Discuss microwave amplifiers versus microwave oscillators.   (05)
     (B) What is compressed smith chart how it is useful in microwave design. (05)
     (C) Design one port oscillator using tunnel diode with $\tau_{in} = 1.25 \angle 40°$ at 8 (10)
         GHz in 50 Ω system

Q.6. (A) Explain in detail single ended diode mixer. What are mixer design (10)
     (B) considerations?   (10)
         What are the advantages of MMIC over HMIC? Also describe the various
         material selection criteria for MMIC.

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