EXTC (R) VIII 25/11/16

AMB (1)

Q. P. Code : 629103

(3 Hours) [Total Marks : 100

N.B. (1) Question No.1 is **compulsory**.
(2) Solve any **four** from remaining **six** questions.
(3) Assume suitable **data** wherever required and **justify** it.
(4) **Figures** to the **right** indicate **full** marks.

1. Answer the following 20
(a) Prove that scattering matrix is symmetrical and reciprocal.
(b) Explain 1-dB compression point.
(c) What are the characteristics of power amplifiers?
(d) Derive the expression of overall noise figure in three cascaded stages of amplifiers.

2. (a) A BJT has the following S-parameters. Is the transistor unconditionally stable? Draw input and output stability circle. 10
$S_{11} = 0.65 \angle -95°$ $S_{22} = 0.8 \angle -35°$
$S_{12} = 0.035 \angle 40°$ $S_{21} = 0.5 \angle 115°$

(b) Explain two methods of broadband amplifier design. 10

3. (a) Discuss amplifier linearization methods. 10
(b) Discuss various mixer topologies. Compare performance of them. 10

4. A GaAs FET has the following S-parameter and noise parameters at 1.0 GHz. (Z_0 = 50 Ω), $S_{11} = 0.61 \angle -155°$, $S_{12} = 0$, $S_{21} = 5.0 \angle 180°$, $S_{22} = 0.51 \angle -20°$ 20
F_{min} = 3dB, $\Gamma_{opt} = 0.45 \angle 180°$, $R_N = 4\Omega$. Design a Low noise amplifier for a noise figure of 3.5dB and power gain of 16dB.

5. (a) Derive the transducer power gain as: 10

$$G_T = \frac{P_L}{P_{avg}} = \frac{|S_{21}|^2(1-|\Gamma_s|^2)(1-|\Gamma_L|^2)}{|1-\Gamma_s\Gamma_{in}|^2|1-S_{22}\Gamma_L|^2}$$

(b) Compare microwave amplifiers with microwave oscillators. 10

6. (a) Discuss the steps of Microwave oscillator design using GaAs FET. 10
(b) Define and explain noise correlation matrix for general noise two port networks. What is congruence transformation?

7. Write short notes on (any two):- 20
(a) Power distributed amplifiers.
(b) Single ended diode mixer.
(c) Microwave resonators.

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