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Reg. No. :

Question Paper Code : 10457

M.E./M.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Second Semester

Applied Electronics

CU 4251 — RF SYSTEM DESIGN

(Common to : M.E. Communication Systems)

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a Noise Figure?
2. Define S parameters of a two port network.
3. Define Flicker Noise.
4. State the advantage of Superheterodyne Receiver.
5. Define Noise Factor.
6. What is Minimum Detectable Signal?
7. Define Image Noise.
8. An oscillator has a drift specification of 25 MHz ± 0.006%. What is the range of output frequencies expected from this oscillator?
9. What is multi band radio?
10. List the limitations of a Direct Conversion transceiver.

PART B — (5 × 13 = 65 marks)

11. (a) Describe the linear and non–linear system. Explain the following parameters: Gain, SNR, Characteristic impedance, S-parameters, Impedance matching, and Decibels.

Or

(b) Explain the digital base-band systems and the importance of transceiver RF system design.

12. (a) Explain the Configuration of a typical Superheterodyne Radio transceiver with a block diagram.

Or

(b) Explain the low IF Receiver architecture with necessary diagrams.

13. (a) Illustrate the Cascade Performance in Wireless Receiver Design for Digital Communications.

Or

(b) Illustrate in detail the non-linear system of Two-Tone Analysis.

14. (a) Describe in detail the Frequency Translation Mechanism in Mixers.

Or

(b) Explain the Effects of Oscillator Spurious Components in detail.

15. (a) Illustrate in detail the Multimode and Multiband Superheterodyne Transmitter System Design.

Or

(b) Explain in detail the Direct Conversion Receiver System Design.

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PART C — (1 × 15 = 15 marks)

16. (a) Design a 7.5 GHz Oscillator in Common emitter BJT configuration. The 'S' parameters, at $V_{CE} = 5.0V$ & $I_e = 20mA$ as follows:

$S_{11} = 0.87 < -40^{\circ}, S_{12} = 0.25, < -32^{\circ},$
$S_{21} = 0.6 < 100^{\circ}, S_{22} = 0 < 165^{\circ}$

Sketch the circuit including the DC biasing network. β is given as 80.

Or

(b) The commercial U.S. FM radio band covers an RF range of about 88 to 108 MHz and converts each station to a 10.7 MHz IF for demodulation. Find

(i) The HSLO range (4)

(ii) The range of HSLO image frequencies (4)

(iii) The LSLO range (4)

(iv) The range of LSLO image frequencies (3)