

Question Bank

Subject: CMOS and RF Circuits Design

Subject Code: BTEC-906C-18

Very Short Answer Type

1. What is a MOSFET?
2. Define the threshold voltage of a MOSFET?
3. What is thermal noise in electronic circuits?
4. Define shot noise?
5. What is flicker noise and why does it occur?
6. Explain popcorn noise?
7. What is the significance of the noise figure in RF circuits?
8. Define Total Harmonic Distortion (THD)?
9. What are IP2 and IP3 in RF systems?
10. What is sensitivity in a communication system?
11. Define Spurious-Free Dynamic Range (SFDR)?
12. What is phase noise in an oscillator?
13. What is the difference between a homodyne and a heterodyne receiver?
14. What is an image reject receiver?
15. What is a Low IF receiver?
16. Explain the purpose of a direct up-conversion transmitter?
17. What is a two-step up-conversion transmitter?
18. What is the role of RF filters in communication systems?
19. Mention two design issues in integrated RF filters?
20. What are active RF components?
21. What is the purpose of matching networks in RF design?
22. Define biasing networks in RF circuits?
23. Name two basic blocks in RF systems?
24. What is an LNA (Low Noise Amplifier)?

25. What is a mixer in RF design?
26. Define an RF frequency synthesizer?
27. What is an RF oscillator?
28. What is the trade-off between noise power and phase noise?
29. How does a MOSFET behave at RF frequencies?
30. What are integrated parasitic elements in high-frequency circuits?
31. What are S-parameters?
32. What is a Smith chart used for?
33. What are passive IC components?
34. What is an impedance matching network?
35. Compare common gate and common source amplifiers?
36. What is the role of OC time constants in bandwidth estimation?
37. Define power matching in high-frequency amplifier design?
38. Define noise matching in RF amplifiers?
39. What is mixed-signal layout?
40. What are interconnects in integrated circuits?
41. Differentiate between voltage-mode and current-mode signaling?
42. What is data transmission in mixed-signal circuits?
43. What are the basics of data converters?
44. Define a Successive Approximation ADC?
45. What is a dual slope ADC?
46. What is a flash ADC?
47. Define a pipeline ADC?
48. What is a hybrid ADC?
49. What is the main advantage of high-resolution ADCs?
50. What is the function of a DAC?

Short Answer Type

1. Explain the working principle of a MOSFET in RF applications?
2. Compare different types of noise in electronic circuits?
3. Discuss the importance of noise figure in RF design?
4. Describe the significance of IP2 and IP3 in RF performance analysis?
5. Explain the concept of SFDR in RF receivers?
6. Compare homodyne and heterodyne receivers?
7. Describe the architecture and working of a Low IF receiver?
8. Explain the significance of image rejection in receiver design?
9. Differentiate between direct up-conversion and two-step up-conversion transmitters?
10. Describe the challenges in RF filter design?
11. Discuss the design issues of integrated RF filters?
12. Explain the purpose of active RF components in circuit design?
13. Discuss matching networks and their impact on RF performance?
14. Explain the function and design considerations of an LNA?
15. Describe the working principle of an RF mixer?
16. Explain the role of an RF frequency synthesizer in communication systems?
17. What are the key design considerations for RF oscillators?
18. Explain the impact of phase noise in RF systems?
19. Discuss MOSFET behavior at high frequencies?
20. Explain integrated parasitic elements and their effect on RF circuits?
21. Describe the significance of S-parameters in RF circuit analysis?
22. Explain the role of the Smith chart in impedance matching?
23. Discuss impedance matching techniques in RF amplifiers?
24. Compare common gate and common source amplifiers in RF applications?
25. Explain the importance of bandwidth estimation in high-frequency amplifiers?
26. Discuss the trade-off between power matching and noise matching?
27. Explain the importance of mixed-signal layout in RF design?

28. Describe interconnects and their impact on data transmission?
29. Compare voltage-mode and current-mode signaling techniques?
30. Explain the significance of data converters in modern electronics?
31. Discuss the working principle of a successive approximation ADC?
32. Explain the operation of a dual slope ADC?
33. Compare flash ADCs and pipeline ADCs?
34. Explain the architecture and working of hybrid ADCs?
35. Describe the advantages and applications of high-resolution ADCs?
36. Compare ADCs and DACs in terms of function and application?
37. Explain the significance of phase noise in communication systems?
38. Discuss the role of power amplifiers in RF design?
39. Describe the working of an RF transceiver system?
40. Explain the importance of biasing networks in RF circuits?

Long Answer Type

1. Explain in detail the physics of MOSFET operation and its behavior at RF frequencies?
2. Discuss different types of noise in electronic circuits and their impact on RF performance?
3. Explain noise figure and its role in receiver sensitivity?
4. Describe the architecture and operation of homodyne and heterodyne receivers with diagrams?
5. Explain in detail the design and working of a Low IF receiver?
6. Compare different transmitter architectures: Direct up-conversion and two-step up-conversion?
7. Explain the challenges and considerations in RF filter design?
8. Discuss active RF components and their significance in RF circuit design?
9. Explain the importance of impedance matching and biasing networks in RF circuits?
10. Describe the design and working of an LNA and its role in RF receivers?
11. Explain RF mixers and their importance in frequency conversion?

12. Discuss RF frequency synthesizers and their role in modern communication systems?
13. Explain phase noise, noise power, and their trade-offs in RF design?
14. Discuss integrated parasitic elements and their effect on high-frequency circuit performance?
15. Explain the S-parameters and how the Smith chart is used in RF design?
16. Describe impedance matching techniques and their importance in RF amplifier design?
17. Explain power match and noise match in high-frequency amplifier design?
18. Discuss the impact of mixed-signal layout and interconnects on data transmission?
19. Compare voltage-mode and current-mode signaling techniques with applications?
20. Explain different ADC architectures, including successive approximation, flash, and pipeline ADCs?
21. Compare and contrast hybrid ADC structures with traditional ADCs?
22. Describe high-resolution ADCs and their role in precision measurement systems?
23. Explain the design and working of DACs in detail?
24. Discuss the design of RF oscillators and their application in communication systems?
25. Explain RF transceiver design and its importance in wireless communication?
26. Discuss the importance of biasing networks and their impact on RF amplifier performance?
27. Compare and analyze different RF amplifier topologies and their applications?
28. Explain the role of power amplifiers in wireless communication?
29. Discuss various RF signal processing techniques used in modern communication systems?
30. Explain the complete design flow of an RF communication system, from transmitter to receiver?