Exam Practice Problems
EE5331, Summer 2001

1. For the most common definition of dynamic range what are the limiting factors on the low and high signal inputs ?

2. Define the parameters in the Friis transmission formula.

3. What is the difference between homodyne and superheterodyne receivers ?

4. What is the definition for antenna gain ? Why is gain important to receiver performance ?

5. What are the two main antenna patterns that are usually of most interest ?

6. What is the insertion loss of a filter and why is this an important parameter ?

7. What characteristics of a filter need to be known to assess the selectivity of a receiver ?

8. What is the significance of the 1 dB compression point for an amplifier ?

9. What important information can be determined from a knowledge of the two-tone third order intercept point of an amplifier ?

10. For a mixer what is an important difference between the spurious responses (in terms of the various harmonics of LO and RF) and the two-tone third order intercept point ?

11. In terms of performance what is an important difference between a balanced mixer and a double-balanced mixer ?

12. What is one advantage of using a high drive level mixer ?

13. Why might an attenuator be used at the IF port of a mixer ?

14. What is phase noise and what is its appearance in a spectrum of an oscillator ?

15. In terms of its basic operation how is a fractional-N synthesizer different than a divide-by-N or M/N synthesizer ?

16. Show graphically how the noise figure of a receiver may be determined in terms of the noise figures of the individual circuit blocks ?

17. What is the difference between gain and maximum effective area for an antenna ?

18. Why is receiver sensitivity often a larger concern for a radar application than for a telecommunications application ?

19. List at least 6 different natural (terrain or atmospheric) effects that influence propagation of radio waves ?

20. Above what frequency do atmospheric effects become very significant ?

21. Draw a sketch of a common setup for measuring AM sensitivity.

22. What is the difference between S/N and SINAD ?

23. Give a definition for noise factor in terms of S/N ratio.

24. What is the difference between a spurious response and a spurious output ?

25. Given a nonlinear circuit with nonlinearity up to and including 3rd order list the frequency components that may be output given two signals, f1 and f2, at the input.

26. What is the reason for using automatic gain control (AGC) ?

27. What is limiting and where may it be used ?

28. What advantages does AGC have over limiting and vice-versa ?

29. Describe the information contained in a spurious response chart for a receiver utilizing difference mixing with high side LO.

30. What information is included in a spurious response level chart for a particular mixer ?

31. What is the criterion for impedance matching between the transmitter output and antenna ?

32. What is the best criterion for impedance matching between the receiver input and antenna ?

33. What is the information contained in the array factor for a particular antenna ? What is its role in determining the overall pattern of the antenna ?

34. What is the idea behind determining the distance to the far field for a particular antenna ?

35. How does the input impedance of a quarter-wave monopole compare to the input impedance of a half-wave dipole ?

36. State 3 reasons why microstrip patch antennas are popular ?

37. IF amplifiers can generally be designed to have higher performance (in many ways) than can RF amplifiers. Why is that ?

38. Why is a cascode stage generally preferred over a CE stage for high frequency operation ?

39. What are important design parameters for an AGC amplifier ?

40. What is the difference between a conventional transformer and a transmission-line transformer ?

41. What is the difference between an image reject mixer and a single-sideband mixer ?

42. State 5 factors that affect the phase noise of an oscillator.

43. List 2 reasons that free-running VCOs are not used in modern communications systems.

44. Show a sketch of the impedance of a typical quartz crystal as a function of frequency.

45. What is a direct digital synthesizer ? Draw a block diagram.

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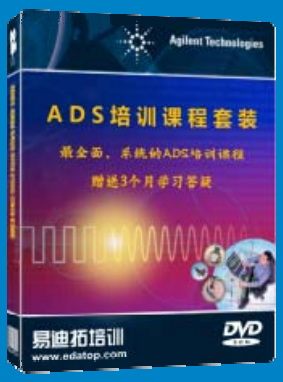

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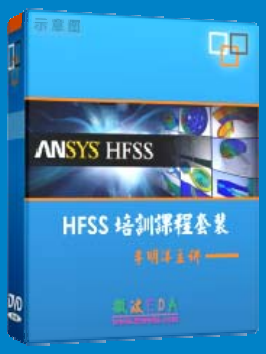

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