- the calculation and definition of horizontal and vertical resolution
- the explanation of NTSC TV receiver operation using a block diagram
- the changes necessary to the black-and-white signal to allow inclusion of color information in a compatible fashion for NTSC television
- the description of MPEG2 and the AC-3 standards for video and audio in DTV
- drawing a block diagram of the basic operation of an 8VSB transmitter
- describing the techniques used in DTV to provide frame and segment sync
- drawing the picture of the processing section for a DTV receiver

Questions and Problems

Section 17-2

1. Describe the 4:2:2 format used to digitize component video.
2. Describe the compression techniques used by the MPEG2 format.
3. Why is the AC-3 digital audio compression technique also called 5.1 Channel Input?
4. Draw a block diagram of the ATSC digital transmission system and identify the data rate at the output of the multiplexer.
5. Describe the operation of the 8VSB exciter. Draw a picture of the 8VSB constellation.
6. Describe the data format for the 8VSB data stream. Identify the purpose of the ATSC pilot, the segment sync, and the frame sync.
7. List the six parts of the 8VSB exciter.
8. Why is the DTV Trellis encoder called a 2/3 encoder?

Section 17-3

9. What is the ATSC transport stream data rate?
10. What three things make up the ATSC transport stream?
11. What does the channel designation 7.1 mean?
12. Why is the PSIP important?
13. What is the pilot signal used for in DTV?
14. What is dBc in reference to DTV?
15. What is PN-23?
16. Draw a diagram of an ideal 8VSB constellation.
17. Open eyes on an 8VSB constellation indicate what?
18. *Cliff effect* is used to describe what in regard to DIV?

Section 17-4

19. Does the sound transmitter at a television broadcast station employ frequency or amplitude modulation?
20. In what way is TV audio equivalent to broadcast FM radio, and in what way is it inferior?
21. Does the video transmitter at a television broadcast station employ frequency or amplitude modulation?
23. List and explain the functions of the six transducers used in a complete TV system.
24. Why is a diplexer a necessary stage of most TV transmitters?
25. Describe the operation of a CCD image pickup device.
26. What is a mosaic plate in a television camera?
27. Sketch the electrical video signal that would result from scanning the letter "E" in the setup shown in Figure 17-3.
28. In television broadcasting, what is the meaning of the term *aspect ratio*?
29. Numerically, what is the aspect ratio of a picture as transmitted by a television broadcast station?

Section 17-5

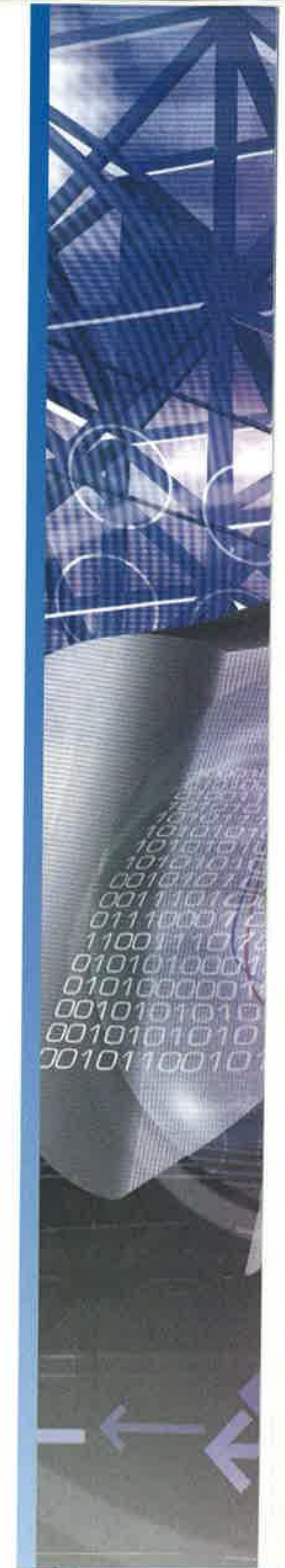
30. What is the purpose of synchronizing pulses in a television broadcast signal?
31. Provide an analogy between horizontal and vertical retrace and reading a book.
32. If the cathode-ray tube in a television receiver is replaced by a larger tube so that the size of the picture is changed from 6 by 8 in. to 12 by 16 in., what change, if any, is made in the number of scanning lines per frame?
33. How many frames per second do television broadcast stations transmit?
34. What is *interlacing*?
35. Why is interlacing used in television broadcasting?
36. What are synchronizing pulses in a television broadcast and receiving system?
37. Why does flicker occur?
38. What are blanking pulses in a television broadcasting and receiving system?
39. Calculate the frequency required for the horizontal sync pulses. (15.8 kHz)
40. What is the field frequency of a television broadcast transmitter?
41. In television broadcasting, why is the field frequency made equal to the frequency of the commercial (ac) power source?
42. Besides the camera signal, what other signals and pulses are included in a complete television broadcast signal?

Section 17-6

43. Describe the characteristics of a video amplifier.
44. Define *resolution, vertical resolution,* and *horizontal resolution.*
45. Calculate the horizontal resolution of a broadcast TV picture. ($\simeq$428 lines)
46. Calculate the decrease in horizontal resolution if the video signal bandwidth were reduced from 4 to 3.5 MHz. (from 428 to 375 lines)
47. Calculate the vertical resolution if the video signal bandwidth were reduced from 4 to 3.5 MHz, assuming that the horizontal resolution was not to change. (307 lines)

Section 17-7

48. If a television broadcast station transmits the video signals on channel 6 (82 to 88 MHz), what is the center frequency of the aural transmitter?



50. What TV channel is most likely to be heard on an FM broadcast receiver? Explain why.
51. What is *vestigial-sideband transmission* of a television broadcast station?

Section 17-8

52. Draw a TV receiver block diagram, and briefly explain the function of each block.
53. What is the typical output voltage of the flyback transformer for a 14-in. (diagonal) CRT? (14 kV)

Section 17-9

54. State what a TV *front end* consists of and the important functions it performs.
55. Show how the VHF tuner is used in conjunction with VHF reception. Why is the VHF signal stepped down in frequency before it is given any amplification?
56. Explain *stagger tuning* and why it is often used in TV IF amplifiers.
57. Calculate the approximate "finger" spacing for a SAW filter operating at 44 MHz. (0.0682 mm)
58. Why are the sound carrier and its sidebands given only one-tenth the amplification of the video by the IF response curve? Explain why part of the video signal is also given less amplification.
59. Discuss the function of a wavetrap and the need for such traps in TV receivers.

Section 17-10

60. If an amplifier stage of the video section shown in Figure 17-14 became inoperative, would the receiver's sound be affected?
61. What is the function of dc restoration, and what kind of video sections require it?

Section 17-11

62. What is the function of the sync separator? How is it able to differentiate between the horizontal and vertical sync pulses? What types of circuits are used for each?
63. What is another name for the sync separator?
64. Explain the relationship between the horizontal deflection system and the CRT anode high-voltage supply. Why is this a failure-prone area in a TV receiver?
65. What are the possible effects of a nonlinear deflection waveform?
66. Explain the operation of the horizontal system schematic shown in Figure 17-18.
67. Explain the function of the damper system and flyback transformer.

Section 17-12

68. Describe the scanning process employed in connection with color TV broadcast.
69. Describe the important features of the Y, I, and Q signals in a color TV broadcast.
70. Define the meaning of *compatibility* with respect to color and monochrome TV. How does a monochrome set properly display a color transmission?
71. Describe the composition of the chrominance subcarrier used in the authorized system of color television.
72. Explain how the Y, I, and Q signals are processed by a color TV receiver.
73. Why is extreme accuracy required of the color subcarrier oscillator within a color TV receiver? Explain how this accuracy is obtained in the receiver.
74. Explain the operation of the color killer. Describe the effect of a defective color killer.
75. Describe the important characteristics and construction of the color CRT. Include the need for convergence and how it is accomplished in this discussion.

Section 17-13

76. Describe the stereo audio system used for TV and explain its superior performance compared to broadcast FM stereo.
77. The audio signal for TV stereo reaches a maximum level of 20 dBm at the transmitter. Calculate the companded audio level for 4 dBm and 15 dBm. (12 dBm, 17.5 dBm)
78. What is HDTV? Give a reason why it has an increased aspect ratio over regular TV.

Section 17-14

79. In several paragraphs, describe a general troubleshooting procedure to be used for repair of a TV receiver.
80. List the probable defective stage(s) for the following symptoms:
    (a) Video and raster normal, sound dead.
    (b) Sound normal, video and raster dim.
    (c) Raster normal, sound and video dead.
    (d) Bent and "contrasty" picture.
    (e) Floating picture, sound and raster normal.
    (f) Loss of vertical sync.
    (g) Loss of horizontal sync.
    (h) Normal sound, no raster.
    (i) No sound or raster.
    (j) No color, black and white normal.
    (k) Loss of one color.
    (l) Loss of color sync.
81. Explain what is meant by the term *raster*. List the probable defective stage(s) if a set's raster is normal but the sound and video are dead.
82. Explain a possible problem if there is no audio output.
83. Describe what would happen if the diode mixer in the VHF/UHF tuner in Figure 17-9 was not functioning.
84. What would the picture be on the color TV if one color was out?
85. Explain what would happen if the AGC was not operating in Figure 17-14.
86. What would the output look like if the brightness control in Figure 17-14 was

Questions for Critical Thinking

87. Explain why vertical resolution is less than the number (about 0.7) of horizontal lines. (*Hint:* Consider what might happen if a pattern of 495 alternate black-and-white horizontal lines were scanned by a TV camera so that each scan saw half of a white-and-black line.)
88. Calculate the sound and picture carrier frequency for channel 10 before and after frequency translation to the IF frequency. What is the required local oscillator frequency? (41 to 47 MHz, 197.75 MHz, 193.25 MHz, 41.25 MHz, 45.75 MHz, 239 MHz)
89. In detail, explain the difference between adjustment of the brightness and contrast controls.
90. Describe the process of interleaving and analyze its importance in enabling the broadcast of color TV on the same bandwidth used in the monochrome system.
91. Describe what problems can be expected with digital television reception.