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## CHAPTER 10

# *Error Detection and Correction*

### Review Questions

1. In a single bit error only one bit of a data unit is corrupted, i.e. changed from 1 to 0 or from 0 to 1, whereas the term burst error means more than one corrupted bit.
3. Parity check, cyclic redundancy check, and checksum.
5. In even parity the number of 1s should be even; in odd parity the number of 1s should be odd.
7. Like the simple parity check, the two-dimensional parity check also uses the parity bit technique for error detection. The difference is in the way the parity bits are calculated. The original data bits are organized in a table of rows and columns. The parity bit is then calculated for each column.
9. The CRC remainder is added to the data unit.
11. The CRC checker divides the received data by the predetermined divisor and accepts the data if the remainder is zero.
13. CRC can detect all burst errors that affect an odd number of bits, all errors of length less than or equal to the degree of the polynomial, and most burst errors of length greater than the degree of the polynomial.
15. One's complement arithmetic.
17. The checker divides the received data into the same number of segments. The segments are added using one's complement to get the sum. The checker then complements the sum. If the result is 0 the data are accepted, otherwise the data are discarded.
19.  $2^r \geq m + r + 1$ , where  $r$  is the number of redundancy bits, and  $m$  is the number of data bits.
21. Rearrange the order of bit transmission so that each error appears in a different data unit.

### Multiple-Choice Questions

23. d

- 25. c
- 27. c
- 29. d
- 31. b
- 33. b
- 35. d
- 37. c
- 39. d
- 41. a
- 43. d

### Exercises

- 45.
  - a. 0
  - b. 0
  - c. 1
  - d. 0
- 47. 11110110
- 49. No error
- 51. 0001101110001100
- 53.
  - a. 5
  - b. 5
  - c. 5
  - d. 7
- 55. 00111010 11001111 11111111 00000000 00001010
- 57. Bits 1, 5, 7, and 8 (from the right) are in error.
- 59. 5 bits long
- 61.  $x^{12} + x^6 + x^5 + x^4 + 1$
- 63. Two redundancy bits, one data bit.
- 65. No errors in the received code; the original code is the same as the received code.