CHAPTER 15

Data Compression

(Solutions to Review Questions and Problems)

Review Questions

Q15-1. The two categories of data compression methods are lossless and lossy.

Q15-3. Run length encoding is a lossless compression method in which repeated occurrences of a symbol are replaced by one occurrence of the symbol followed by the number of occurrences.

Q15-5. Huffman coding uses the frequency of the characters in the file to construct a tree. The tree is then used to generate codes for each character with the more frequent characters having shorter codes than the less frequent characters.

Q15-7. In Huffman coding, both the sender and receiver must have a copy of the same code in order for the decoded file to match the encoded file. In LZ encoding, the dictionary is generated from the data itself.

Q15-9. JPEG is used to compress images while MPEG is used to compress video.

Q15-11. Blocking is the act of dividing the image into 8×8 blocks in order to reduce the number of calculations.

Q15-13. Quantization of the T table reduces the number of bits needed for encoding each value.

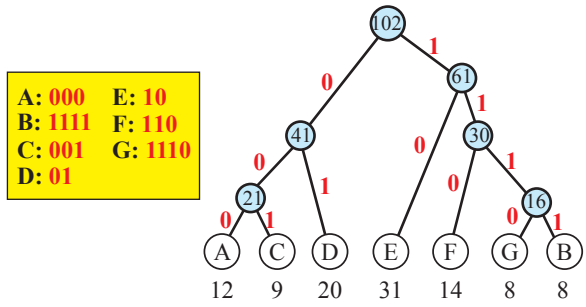
Q15-15. Spatial compression is the compression of each frame by using a modified version of JPEG; temporal compression is the removal of redundant frames in MPEG.

Problems

P15-1. 10010 00000 11111 11001 01111 00000 00000

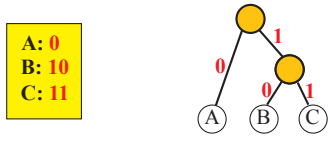
P15-3. Different codes result from different ways of organizing the tree. One possible tree with the resulting code is shown Figure 15.1.

Figure 15.1 *Solution to P15-3*



P15-5. This can be a Huffman code. The shorter codes is not the prefix of any of the two longer codes. The tree is shown in Figure 15.2.

Figure 15.2 *Solution to P15-5*



P15-7. 100 0101 0101 000 1100

P15-9. Encoding is shown in Figure 15.3. Decoding is shown in Figure 15.3.

Figure 15.3 *Solution to P15-9, encoding*

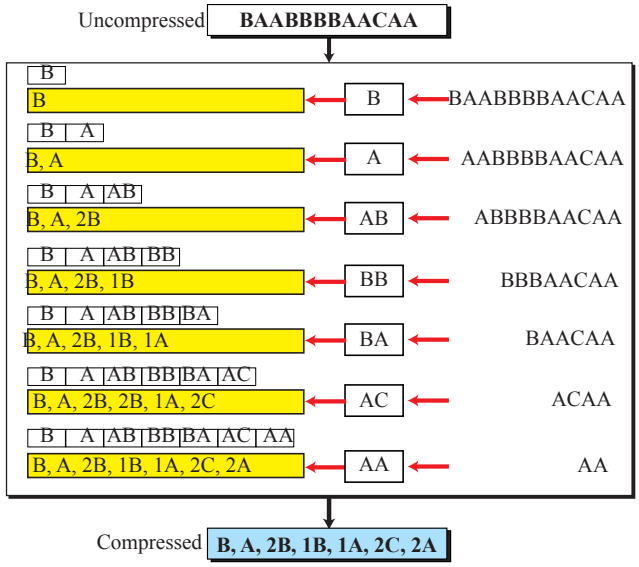
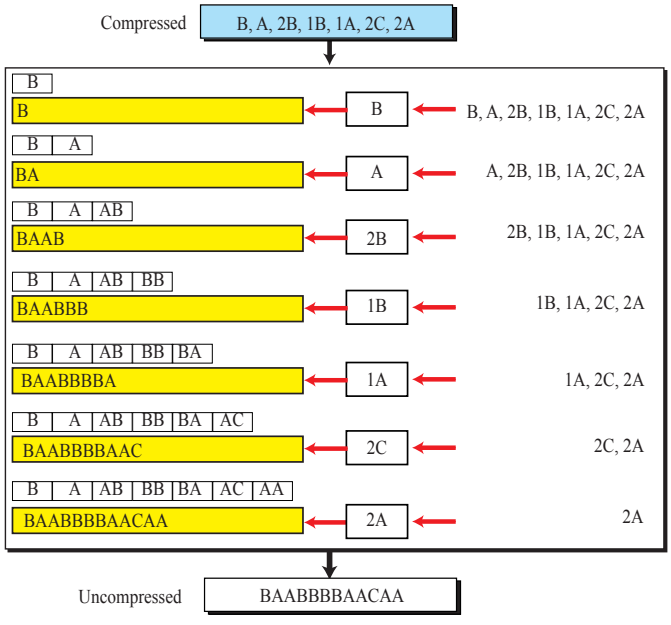


Figure 15.4 *Solution to P15-9, decoding*



P15-11. Calculations are shown in Table 15.1.

Table 15.1 *Solution to P15-11*

T(0, 0)	=	1/16 [16 + 32 + 128 + 48]	=	17.00
T(0, 1)	=	1/16 [0.94 (64) + 0.90 (32) + 0.85 (128) + 0.80 (48)]	=	14.08
T(1, 0)	=	1/16 [0.90 (64) + 0.85 (32) + 0.80 (128) + 0.75 (48)]	=	13.59
T(1, 1)	=	1/16 [0.85 (64) + 0.80 (32) + 0.75 (128) + 0.70 (48)]	=	13.10