A-law quantization:

Q3.10 according to Table 3.1

NB: One correction for Table 3.1

Segment

|1 | h | 32 | 2 | 4 | … | 64|

In the question, we should specify value of A and how many bits quantization.

However, if we specify that according to Table 3.1, actually A value and how many bits quantization are specified, because in the table we can observe 128 different values. Considering values less than 0, therefore this quantization is specified is 8 bits. It is evident that we are looking at 13-bit uniform quantization to A law 8-bit quantization, since the maximum value in the table is 4096.

Ok, let’s move on and get this question done.

Let me give you a shortcut to quantize the values according to A law.

Remember A law is defined as a conditional equation. In the case of segment 1, there are 32 intervals. It means we need 5 bits to differentiate them. For the rest segments, we only need 4 bits.

Let’s work out a. Don’t be confused by h.

a = 2\*1024/(2\*2096)=0.25

Thus, in the question

5.5 is 5.5/0.25 = 22a

31.3: 125a

199: 796a

389: 1556a

744:2976a

1200(overflow > Vc) 1024\*4=4096a

We assume in the table, 00000000 denotes 2a.

22a is in the range of segment 1. (h=2a) (22a-2a)/h = 10, in binary is 00001010.

125a is in the range of segment 2. (h=2a) (125a-68a)/2h = 10, in binary is 00101110.

From segment 2 to 7, there are 16 intervals in each section, therefore 4 bits are enough to enumerate all values in these segments. 10 in binary is 1110. Here 0010 comes from the first bit is sign and if it’s positive is 0. And 010 is incremented from 001, which is used by segment 1. As I mentioned before, it’s a shortcut. If you use the formula 3.9, we’ll get the exact result. Of coz, if we mention it’s according to Table 3.1 to get the quantization value, we can go straight to use the table.

The rest calculations follow the same rule:

796a is in the range of segment 5. (h=2a) (796a-544a)/16h = 7, in binary is 01010111.

1556a is in the range of segment 6. (h=2a) (1556a-1088a)/32h = 7, in binary is 01100111.

4096a is in the range of segment 7. (h=2a) (4096a-2176a)/64h = 15, in binary is 01111111.