

12 ✓ 14

$$a) \text{ Entropy} = - \sum p \log_2 p$$

$0:5$ $3:2$ $6:4$ $P = 1/32$
 $1:4$ $4:4$ $7:4$
 $2:3$ $5:3$

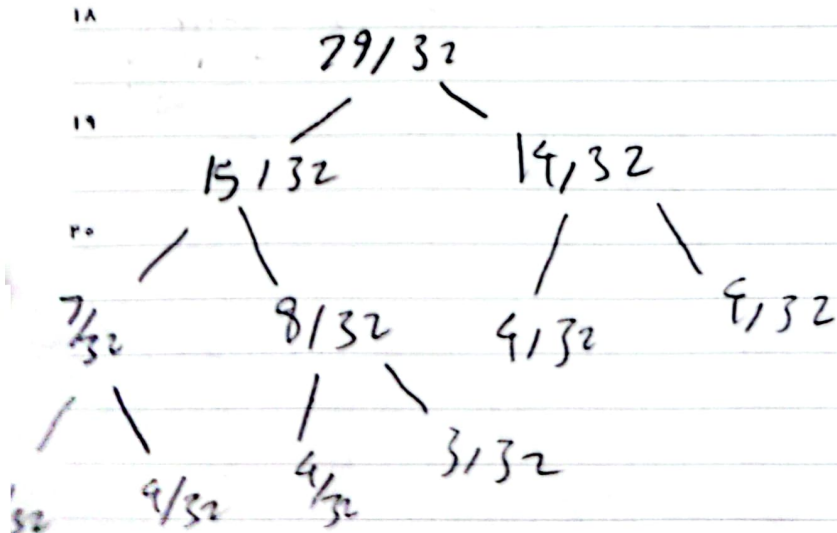
¹² → Entropy = 2.80 bit

b) $0151 \frac{5}{32}$ $4141 \frac{4}{32}$

10 $1 \mid 4 \mid 4/32$ $513 \mid 3/32$

$$19 \quad 2 \mid 3 \mid 3/32 \quad 6 \mid 4 \mid 4/32$$

iv $312 \mid \frac{2}{32}$ $714 \mid \frac{4}{32}$



0 = 00

4 = 10

7

1 = 01

5 = 011

8

2 = 111

6 = 100

9

3 = 110

7 = 101

10

$$\text{Efficiency} = \sum p_i \times \text{length} = \frac{5}{32} \times 2 + \dots$$

13

$$= 2.3125$$

14

$$\text{Redundancy} = \text{max possible Entropy} - \text{Actual Entropy}$$

$$= -\log_2 \frac{1}{8} - 2.8 = 0.2$$

16

17

c) when the image histogram has

18

skewed distribution with a few

19

Pixel values occurring more freq than others. fewer rare pixel values.

20

d) RLE can compress consecutive

repeated pixel values by replacing them with a count and the pixel

value itself

(0, 2) (2, 2) (7, 4)

(0, 2) (2, 1) (3, 1) (6, 2) (9, 1)

(0, 1) (2, 1) (1, 1) (3, 1) (6, 2) (5, 1) (9, 1)

(1, 3) (6, 1) (5, 2) (4, 2)

0 2 2 2 7 4

0 2 2 1 3 1 6 2 4 1

0 1 2 1 1 1 3 1 6 2 5 1 4 1

1 3 6 1 5 2 4 2

e) arithmetic coding and delta encoding

delta: the spatial redundancy in the image will be exploited

۰ ۰ ۲ ۲ ۷ ۷ ۷ ۷
 ۰ ۰ ۲ - ۲ - ۹ - ۱ ۰ - ۳
 ۰ ۲ - ۱ ۱ ۳ ۰ - ۱ - ۱
 ۱ ۰ ۰ ۵ - ۱ ۰ - ۱ ۰

representation
 of the difference

The type of redundancy targeted is
 temporal redundancy. focuses on the
 patterns and correlations.