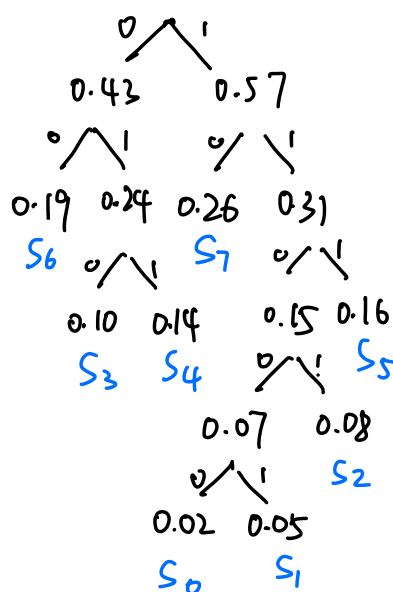
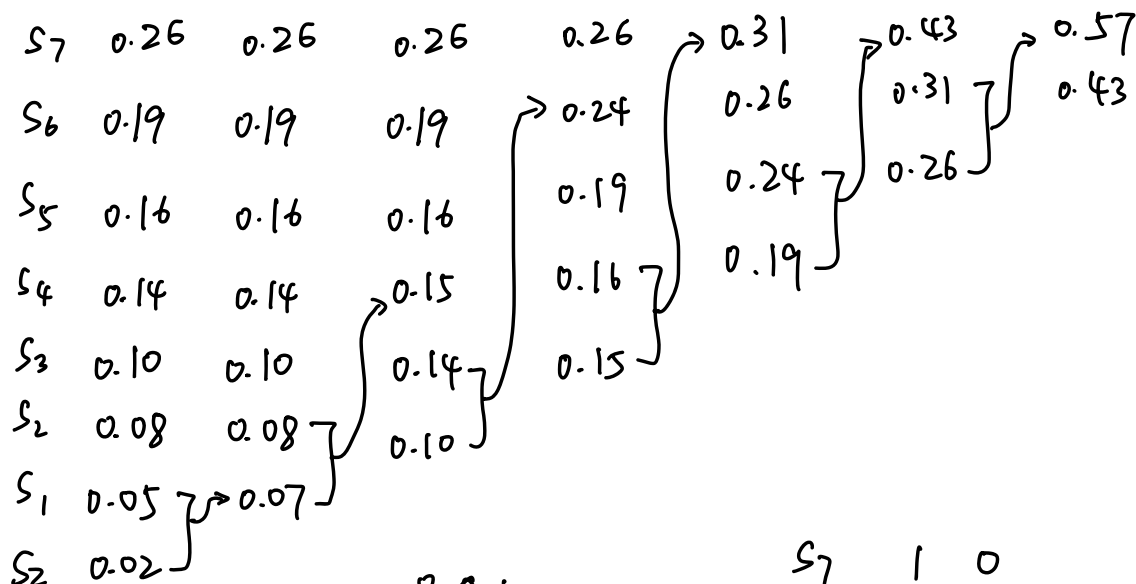


Exercise Huffman Coding 2.

Q: (i) Huffman

Solution



S ₇	1	0		
S ₆	0	0		
S ₅	1	1	1	
S ₄	0	1	1	
S ₃	0	1	0	
S ₂	1	1	0	1
S ₁	1	1	1	0
S ₀	1	1	0	0

(ii) average number of bit/symbol

$$\text{Rate} = 2 \times (0.26 + 0.19) + 3 \times (0.16 + 0.14 + 0.10) + 4 \times 0.08 + 5 \times (0.05 + 0.02) = 2.77 < 8$$

the Huffman codebook compression ratio

is better $\text{ratio} = \frac{\text{un compressed scheme}}{\text{compressed scheme}}$

$$= \frac{8}{2.77} = 2.882$$

(iii) entropy $< 2.5 \text{ bits/symbol?}$

$$\eta = H(S) = \sum_{i=1}^n p_i \log_2 \frac{1}{p_i} = - \sum_{i=1}^n p_i \log p_i$$

$$= -[0.02 \log_2 0.02 + 0.05 \log_2 0.05 + \dots + 0.28 \log_2 0.28]$$

$$= 2.7333$$

No way, due to code word compression ratio will not less than entropy