HANU
HANOI UNIVERSITY

FACULTY OF INFORMATION TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE

HOMEWORK

Discrete Mathematics

TUT-12: Problem Set 12

Problem 1: Exercises 1-8 in text book [1] – page 839.

Problem 2

Given a data source of 8 characters A, B, C, D, E, F with probability of appearance as follows:

A	B	C	D	E	F
0.15	0.24	0.31	0.09	0.10	0.11

1. Encode the source and find the codewords for those characters. Draw the Huffman tree.
2. Calculate the average length of codewords ($\overline{L}$) and the entropy (H) of the source by the following equations

$$\overline{L} = \sum_{i=1}^{m} L_i \times p_i; \tag{1}$$

$$H = \sum_{i=1}^{m} p_i \times \log_2\left(\frac{1}{p_i}\right) \tag{2}$$

where m is number of different characters, L_i and p_i are length and probability of the ith codeword.

Problem 3

Given a data source of 8 characters A, B, C, D, E, F, G, H, I with probability of appearance as follows:

A	B	C	D	E	F	G	H	I
0.14	0.03	0.21	0.19	0.10	0.11	0.08	0.13	0.01

1. Encode the source and find the codewords for those characters. Show the Huffman tree.
2. If the length of the source is 10000, calculate C and S by the following equations

$$\text{Compression Ratio} : C = \frac{\text{Uncomressed Size}}{\text{Comressed Size}} \tag{3}$$

$$\text{Space Saving} : S = 1 - \frac{\text{Comressed Size}}{\text{Uncomressed Size}} \tag{4}$$

References

[1] K. H. Rosen, *Discrete Mathematics and Its Applications*, McGraw-Hill, 8th edition, 2019.

[2] S. S. Epp, *Discrete Mathematics with Applications*, Cengage, 5th edition, 2020.