30/10/2023

BBIT/MG/1043/09/20

ASSGN1

BBIT 412: MULTIMEDIA SYSTEMS

A. A series of messages is to be transferred between two computers over a PSTN. The messages comprise just the characters A through H. Analysis has shown that the probability (relative frequency of occurrence) of each character is as follows:
A and B = 0.25 C and D = 0.14 E, F, G and H = 0.055

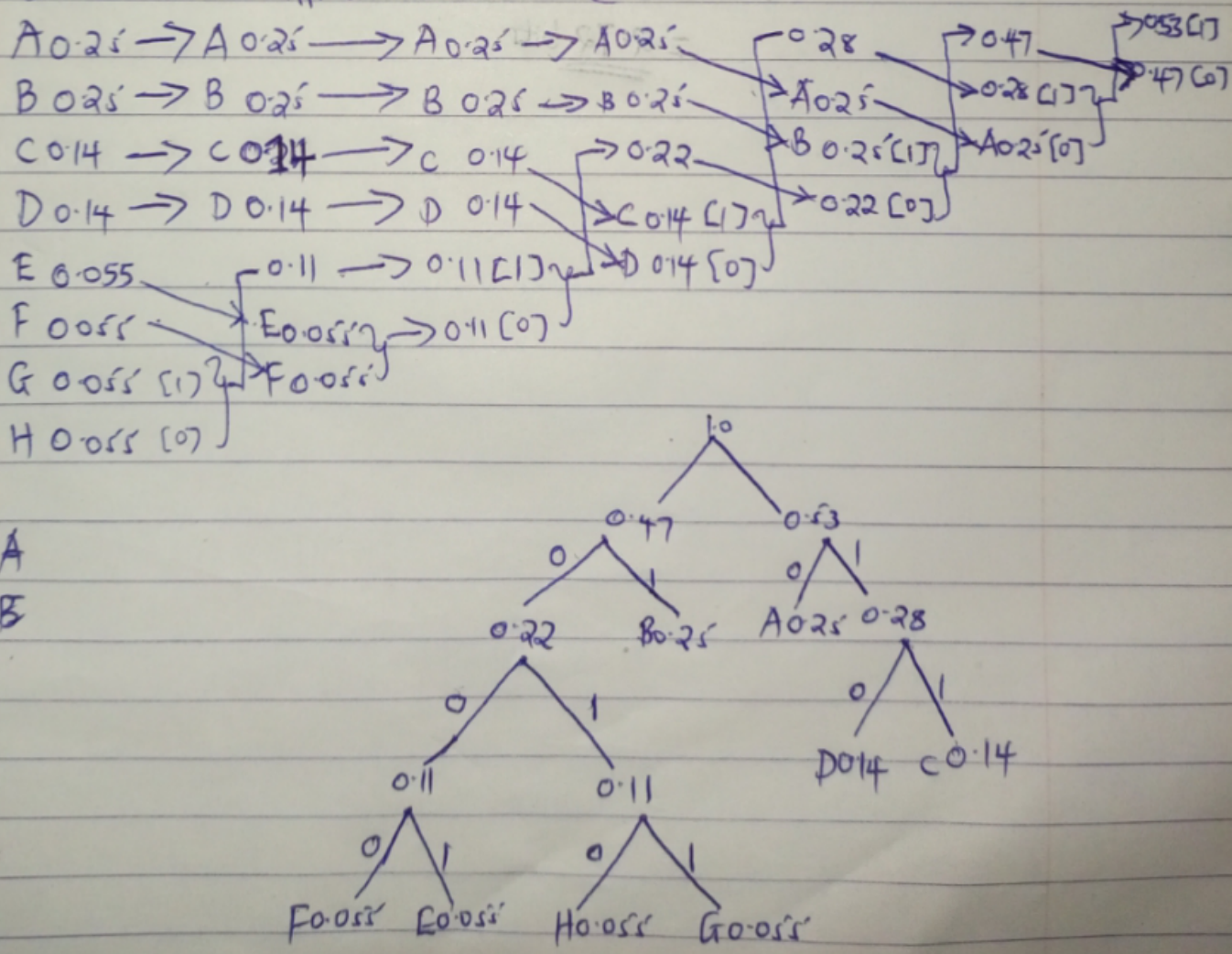
i) Calculate the Entropy (5mrks)

$$\text{Enthropy} = -\sum_{i=1}^{8} p(i) \log_2 p(i)$$

$$= -\left[2(0.25 \times \log_2(0.25)) + 2(0.14 \times \log_2(0.14)) + 4(0.055 \times \log_2(0.055))\right]$$

$$= 2.175 \text{ bits}$$

ii) Draw the Huffman code tree (5mrks)



iii) Derive the code for each character (5mrks)

A = [0][1] ⟶ 10

B = [1][0] ⟶ 01

C = [1][1][1] ⟶ 111

D = [0][1][1] ⟶ 110

E = [1][0][0][0] ⟶ 0001

F = [0][0][0][0] ⟶ 0000

G = [1][1][0][0] ⟶ 0011

H = [0][1][0][0] ⟶ 0010

iv) Compute the average code length per character

$2(2 \times 0.25) + 2(3 \times 0.14) + 4(4 \times 0.055))$

$= 2.72$ bits

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