

ECE 412 Problem Set

① $\tilde{X} \rightarrow \text{R.V.}$ $R_{\tilde{X}} = \{a, b, c, d\}$

$$p(a) = 1/2 \quad p(b) = 1/4 \quad p(c) = 1/8 \quad p(d) = 1/8$$

- a) $H(\tilde{X}) = ?$ b) Determine a prefix code for $\tilde{X}$ values and compute average codeword length
- c) Find Huffman code for $\tilde{X}$ and compute average codeword length
- d) Find Shannon codeword lengths and compute average codeword length

② $\tilde{X} \rightarrow \text{R.V.}$ $R_{\tilde{X}} = \{a, b\}$ $p(a) = 1/4$ $p(b) = 3/4$

Encode BBA using arithmetic encoding approach

③ A A B A A C D A B B A A C C C C B B

Encode the above string using HDC

- ④ First encode then decode the following string using LZW method

A A B A A B A A B B B B A A B B B B A B B

- ⑤ Why do we use move to front coding?

⑥ $\tilde{X} \rightarrow \text{R.V.}$ $R_{\tilde{X}} = \{a, b\}$ $p(a) = 1/4$ $p(b) = 3/4$

- a) $H(\tilde{X}) = ?$ b) Consider symbol pairs aa, ab, ba, bb

Huffman encode aa, ab, ba, bb . Compute average codeword length and show that $H(\tilde{X}) \leq L_n \leq H(\tilde{X}) + \frac{1}{n}$

- ⑦ Study Kraft inequality. $L_n = \text{average codeword length for pairs}$ $L_n = \frac{L}{n}$