**Laboratory Experiment No. 03**

**Problem Statement:** Simulate Shannon fano/ Huffman code using MATLAB/Octave. Determine Efficiency and redundancy for the given Source Coding technique. (D1)

clc;

clear all;

close all;

pkg load communications

symbols = 1:5;

p=[0.40 0.20 0.20 0.10 0.10];

disp("\nSymbols are");

disp(symbols);

disp("length of symbols=");

disp(length(symbols));

disp("\nRespective probabilities are");

disp(p);

dict = huffmandict(symbols,p);

disp("\nHuffman dictionary is");

disp(dict);

inputSig = randsrc(10,1,[symbols;p]);

%inputSig =[1 1 1 1 2 2 2 3 3 4];

%disp("\nRandom generated input symbols are");

disp("\ninput symbols are");

disp(inputSig);

code = huffmanenco(inputSig,dict);

disp("\nEncoded message is");

disp(code);

decode = huffmandeco(code,dict);

disp("\nDecoded symbols are");

disp(decode);

avg\_code\_len=0;

for i=1:length(symbols)

%disp(p(i));

%disp(length(dict(1:i)));

%disp(total\_code\_len=p(i)\*length(dict(1:i)));

total\_code\_len=p(i)\*length(dict(1:i));

avg\_code\_len=avg\_code\_len+total\_code\_len;

end

disp("avg\_code\_len=");

disp(avg\_code\_len);

H = -sum(p .\* log2(p));

disp("Entropy=");

disp(H);

efficiency=H/avg\_code\_len;

disp("Efficiency=");

disp(efficiency);

redundancy = 1 - efficiency;

disp("Redundancy=")

disp(redundancy);

**Output:**

Symbols are

1 2 3 4 5

length of symbols=

5

Respective probabilities are

0.4000 0.2000 0.2000 0.1000 0.1000

Huffman dictionary is

{

[1,1] = 1

[1,2] =

0 1

[1,3] =

0 0 1

[1,4] =

0 0 0 0

[1,5] =

0 0 0 1

}

input symbols are

2

4

1

2

3

2

1

4

1

1

Encoded message is

0 1 0 0 0 0 1 0 1 0 0 1 0 1 1 0 0 0 0 1 1

Decoded symbols are

2 4 1 2 3 2 1 4 1 1

avg\_code\_len=

2.3000

Entropy=

2.1219

Efficiency=

0.9226

Redundancy=

0.077423