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