Experiment No. 4

```
% Name: Prajwal Dhopre
% Roll No.: 53
% Batch: A3
% Date: 24-03-2023

% Aim: To Perform Huffman coading

% Objective: Calculation of entropy, efficiency, average code word length,
% variance for huffman code
```

example 1: Consider a DMS with 5 symbols having probabilities 0.4, 0.2, 0.2, 0.1, 0.1. Apply a huffman code to encode and find average code word length, entropy, efficiency, redundancy.

```
clc;
lk = [2;2;2;3;3]
pk = [0.4, 0.2, 0.2, 0.1, 0.1]
Lavg = pk*lk
x = [log2(1/0.4); log2(1/0.2); log2(1/0.2); log2(1/0.1); log2(1/0.1)]
H = pk * x
efficiency = (H/Lavg)*100
Redundancy = (100-efficiency)
```

lk =

```
     2
     2
     2
     3
     3
```

pk =

```
    0.4000    0.2000    0.2000    0.1000    0.1000
```

Lavg =

```
    2.2000
```

x =

```
    1.3219
    2.3219
    2.3219
    3.3219
    3.3219
```

H =

   2.1219

efficiency =

   96.4513

Redundancy =

   3.5487

example 2: Consider a DMS with alphabet x1, x2 and probability 0.8 & 0.2 apply huffman code to encode and find average code word length, entropy, efficiency, redundancy,. Repeat encoding process for and also find average code word length, redundancy.

```matlab
% 1st order
clc;
lk = [1;1]
pk = [0.8, 0.2]
Lavg = pk*lk
x = [log2(1/0.8); log2(1/0.2)]
H = pk * x
efficiency = (H/Lavg)*100
Redundancy = (100-efficiency)
```


lk =

    1
    1

pk =

   0.8000   0.2000

Lavg =

    1

x =

   0.3219
   2.3219

H =

```
   0.7219


efficiency =

   72.1928


Redundancy =

   27.8072
```

2st order

```
lk = [1;2;3;3]
pk = [0.64, 0.16, 0.16, 0.04]
Lavg = pk*lk
x = [log2(1/0.64); log2(1/0.16); log2(1/0.16); log2(1/0.04)]
H = pk * x
efficiency = (H/Lavg)*100
Redundancy = (100-efficiency)


lk =

     1
     2
     3
     3


pk =

    0.6400    0.1600    0.1600    0.0400


Lavg =

    1.5600


x =

    0.6439
    2.6439
    2.6439
    4.6439


H =

    1.4439
```

efficiency =

   92.5549

Redundancy =

   7.4451

3st order

```
lk = [1;3;3;3;5;5;5;5]
pk = [0.512, 0.128, 0.128, 0.128, 0.032, 0.032, 0.032, 0.008]
Lavg = pk*lk
x = [log2(1/0.512); log2(1/0.128); log2(1/0.128); log2(1/0.128);
    log2(1/0.032); log2(1/0.032); log2(1/0.032); log2(1/0.008)]
H = pk * x
efficiency = (H / Lavg)*100
Redundancy = (100-efficiency)
```


lk =

    1
    3
    3
    3
    5
    5
    5
    5

pk =

  Columns 1 through 7

| *0.5120* | *0.1280* | *0.1280* | *0.1280* | *0.0320* | *0.0320* | *0.0320* |

  Column 8

   0.0080

Lavg =

   2.1840

x =

   0.9658

```
    2.9658
    2.9658
    2.9658
    4.9658
    4.9658
    4.9658
    6.9658


H =

    2.1658


efficiency =

   99.1659


Redundancy =

    0.8341
```

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