**Code & Explanation:**

clc;

clear all;

close all;

m=input('Enter the number of message ensembles'); %number of symbols

z=[];

h=0; l=0;

display('Enter the probabilities in descending order'); % taking input of the probabilities of symbols

%in descending order

for i=1:m

fprintf('Ensemble %d\n', i);

p(i)=input('');

end

%Finding each alpha values

a(1)=0; %Alpha matrix is cumulative sum of the probabilities

for j=2:m;

a(j)=a(j-1)+p(j-1);

end

fprintf('\n Alpha matrix');

display(a); % displaying alpha matrix

%Finding each code length

for i=1:m;

n(i)=ceil(-1\*(log2(p(i)))); %calculating the length of the codes

end

fprintf('\n Code length matrix');

display(n);

for i=1:m

int=a(i);

for j=1:n(i);

fract= int\*2;

c=floor(fract); % finding codeword

fract=fract-c;

z=[z c];

int = fract;

end

fprintf('Codeword %d',i);

display(z);

z=[];

end

fprintf('Avg. Code length');

for i=1:m

x=p(i)\*n(i);

display(x);

Output:

Enter the number of message ensembles 4

Enter the probabilities in descending order

Ensemble 1

.2

Ensemble 2

.13

Ensemble 3

.33

Ensemble 4

.34

Alpha metrix

a =

0 0.2000 0.3300 0.6600

Code length matrix

n =

3 3 2 2

Codeword 1

z =

0 0 0

Codeword 2

z =

0 0 1

Codeword 3

z =

0 1

Codeword 4

z =

1 0

Avg. Code length

x =

0.6000

x =

0.3900

x =

0.6600

x =

0.6800