HauffmanTest.java

============ a +++++++++++++++

a occurs 1 times

=======================================

==== Tree built in this order===============

Leaf node 1 Character is a Weight is 1

Internal node 2 : Left a(1) Right null Weight = 1

==== Tree has 2 nodes===============

You can see dot file at C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\1.dot

Run the following command to get pdf file

dot -Tpdf C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\1.dot -o C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\1.dot.pdf

============Code for each character in a ===============

a Has Code 0

=======================================

======= Original String========

a

======= Decoded String========

0

======= Recovered String========

a

Original string cost = 7.0

Decoded string cost = 1.0

% reduction = 85.71428571428571

============ aba +++++++++++++++

a occurs 2 times

b occurs 1 times

=======================================

==== Tree built in this order===============

Leaf node 1 Character is a Weight is 2

Leaf node 2 Character is b Weight is 1

Internal node 3 : Left b(1) Right a(2) Weight = 3

==== Tree has 3 nodes===============

You can see dot file at C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\2.dot

Run the following command to get pdf file

dot -Tpdf C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\2.dot -o C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\2.dot.pdf

============Code for each character in aba ===============

a Has Code 1

b Has Code 0

=======================================

======= Original String========

aba

======= Decoded String========

101

======= Recovered String========

aba

Original string cost = 21.0

Decoded string cost = 3.0

% reduction = 85.71428571428571

============ aaabbggggghhhhaaaggggaaaaa\_+@# +++++++++++++++

@ occurs 1 times

a occurs 11 times

b occurs 2 times

# occurs 1 times

g occurs 9 times

h occurs 4 times

+ occurs 1 times

\_ occurs 1 times

=======================================

==== Tree built in this order===============

Leaf node 1 Character is @ Weight is 1

Leaf node 2 Character is a Weight is 11

Leaf node 3 Character is b Weight is 2

Leaf node 4 Character is # Weight is 1

Leaf node 5 Character is g Weight is 9

Leaf node 6 Character is h Weight is 4

Leaf node 7 Character is + Weight is 1

Leaf node 8 Character is \_ Weight is 1

Internal node 9 : Left @(1) Right #(1) Weight = 2

Internal node 10 : Left \_(1) Right +(1) Weight = 2

Internal node 11 : Left b(2) Right (2) Weight = 4

Internal node 12 : Left (2) Right (4) Weight = 6

Internal node 13 : Left h(4) Right (6) Weight = 10

Internal node 14 : Left g(9) Right (10) Weight = 19

Internal node 15 : Left a(11) Right (19) Weight = 30

==== Tree has 15 nodes===============

You can see dot file at C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\3.dot

Run the following command to get pdf file

dot -Tpdf C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\3.dot -o C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\3.dot.pdf

============Code for each character in aaabbggggghhhhaaaggggaaaaa\_+@# ===============

@ Has Code 11100

a Has Code 0

b Has Code 11110

# Has Code 11101

g Has Code 10

h Has Code 110

+ Has Code 111111

\_ Has Code 111110

=======================================

======= Original String========

aaabbggggghhhhaaaggggaaaaa\_+@#

======= Decoded String========

0001111011110101010101011011011011000010101010000001111101111111110011101

======= Recovered String========

aaabbggggghhhhaaaggggaaaaa\_+@#

Original string cost = 210.0

Decoded string cost = 73.0

% reduction = 65.23809523809524

============ A quick brown fox jumps over the lazy dog +++++++++++++++

A occurs 1 times

occurs 8 times

a occurs 1 times

b occurs 1 times

c occurs 1 times

d occurs 1 times

e occurs 2 times

f occurs 1 times

g occurs 1 times

h occurs 1 times

i occurs 1 times

j occurs 1 times

k occurs 1 times

l occurs 1 times

m occurs 1 times

n occurs 1 times

o occurs 4 times

p occurs 1 times

q occurs 1 times

r occurs 2 times

s occurs 1 times

t occurs 1 times

u occurs 2 times

v occurs 1 times

w occurs 1 times

x occurs 1 times

y occurs 1 times

z occurs 1 times

=======================================

==== Tree built in this order===============

Leaf node 1 Character is A Weight is 1

Leaf node 2 Character is Weight is 8

Leaf node 3 Character is a Weight is 1

Leaf node 4 Character is b Weight is 1

Leaf node 5 Character is c Weight is 1

Leaf node 6 Character is d Weight is 1

Leaf node 7 Character is e Weight is 2

Leaf node 8 Character is f Weight is 1

Leaf node 9 Character is g Weight is 1

Leaf node 10 Character is h Weight is 1

Leaf node 11 Character is i Weight is 1

Leaf node 12 Character is j Weight is 1

Leaf node 13 Character is k Weight is 1

Leaf node 14 Character is l Weight is 1

Leaf node 15 Character is m Weight is 1

Leaf node 16 Character is n Weight is 1

Leaf node 17 Character is o Weight is 4

Leaf node 18 Character is p Weight is 1

Leaf node 19 Character is q Weight is 1

Leaf node 20 Character is r Weight is 2

Leaf node 21 Character is s Weight is 1

Leaf node 22 Character is t Weight is 1

Leaf node 23 Character is u Weight is 2

Leaf node 24 Character is v Weight is 1

Leaf node 25 Character is w Weight is 1

Leaf node 26 Character is x Weight is 1

Leaf node 27 Character is y Weight is 1

Leaf node 28 Character is z Weight is 1

Internal node 29 : Left A(1) Right b(1) Weight = 2

Internal node 30 : Left y(1) Right f(1) Weight = 2

Internal node 31 : Left x(1) Right n(1) Weight = 2

Internal node 32 : Left w(1) Right g(1) Weight = 2

Internal node 33 : Left v(1) Right p(1) Weight = 2

Internal node 34 : Left q(1) Right c(1) Weight = 2

Internal node 35 : Left t(1) Right h(1) Weight = 2

Internal node 36 : Left s(1) Right i(1) Weight = 2

Internal node 37 : Left a(1) Right d(1) Weight = 2

Internal node 38 : Left j(1) Right k(1) Weight = 2

Internal node 39 : Left l(1) Right z(1) Weight = 2

Internal node 40 : Left m(1) Right (2) Weight = 3

Internal node 41 : Left (2) Right (2) Weight = 4

Internal node 42 : Left (2) Right e(2) Weight = 4

Internal node 43 : Left (2) Right (2) Weight = 4

Internal node 44 : Left (2) Right u(2) Weight = 4

Internal node 45 : Left (2) Right (2) Weight = 4

Internal node 46 : Left (2) Right r(2) Weight = 4

Internal node 47 : Left (2) Right (3) Weight = 5

Internal node 48 : Left (4) Right (4) Weight = 8

Internal node 49 : Left (4) Right o(4) Weight = 8

Internal node 50 : Left (4) Right (4) Weight = 8

Internal node 51 : Left (4) Right (5) Weight = 9

Internal node 52 : Left (8) Right (8) Weight = 16

Internal node 53 : Left (8) Right (8) Weight = 16

Internal node 54 : Left (9) Right (16) Weight = 25

Internal node 55 : Left (16) Right (25) Weight = 41

==== Tree has 55 nodes===============

You can see dot file at C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\4.dot

Run the following command to get pdf file

dot -Tpdf C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\4.dot -o C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\4.dot.pdf

============Code for each character in A quick brown fox jumps over the lazy dog ===============

A Has Code 01100

Has Code 00

a Has Code 10000

b Has Code 01101

c Has Code 01011

d Has Code 10001

e Has Code 0111

f Has Code 110001

g Has Code 111011

h Has Code 111001

i Has Code 110101

j Has Code 10100

k Has Code 10101

l Has Code 101110

m Has Code 10110

n Has Code 10011

o Has Code 1111

p Has Code 01001

q Has Code 01010

r Has Code 11001

s Has Code 110100

t Has Code 111000

u Has Code 11011

v Has Code 01000

w Has Code 111010

x Has Code 10010

y Has Code 110000

z Has Code 101111

=======================================

======= Original String========

A quick brown fox jumps over the lazy dog

======= Decoded String========

01100000101011011110101010111010100011011100111111110101001100110001111110010001010011011101100100111010000111101000011111001001110001110010111001011101000010111111000000100011111111011

======= Recovered String========

A quick brown fox jumps over the lazy dog

Original string cost = 287.0

Decoded string cost = 185.0

% reduction = 35.54006968641115

============ Pack my box with five dozen liquor jugs +++++++++++++++

P occurs 1 times

occurs 7 times

a occurs 1 times

b occurs 1 times

c occurs 1 times

d occurs 1 times

e occurs 2 times

f occurs 1 times

g occurs 1 times

h occurs 1 times

i occurs 3 times

j occurs 1 times

k occurs 1 times

l occurs 1 times

m occurs 1 times

n occurs 1 times

o occurs 3 times

q occurs 1 times

r occurs 1 times

s occurs 1 times

t occurs 1 times

u occurs 2 times

v occurs 1 times

w occurs 1 times

x occurs 1 times

y occurs 1 times

z occurs 1 times

=======================================

==== Tree built in this order===============

Leaf node 1 Character is P Weight is 1

Leaf node 2 Character is Weight is 7

Leaf node 3 Character is a Weight is 1

Leaf node 4 Character is b Weight is 1

Leaf node 5 Character is c Weight is 1

Leaf node 6 Character is d Weight is 1

Leaf node 7 Character is e Weight is 2

Leaf node 8 Character is f Weight is 1

Leaf node 9 Character is g Weight is 1

Leaf node 10 Character is h Weight is 1

Leaf node 11 Character is i Weight is 3

Leaf node 12 Character is j Weight is 1

Leaf node 13 Character is k Weight is 1

Leaf node 14 Character is l Weight is 1

Leaf node 15 Character is m Weight is 1

Leaf node 16 Character is n Weight is 1

Leaf node 17 Character is o Weight is 3

Leaf node 18 Character is q Weight is 1

Leaf node 19 Character is r Weight is 1

Leaf node 20 Character is s Weight is 1

Leaf node 21 Character is t Weight is 1

Leaf node 22 Character is u Weight is 2

Leaf node 23 Character is v Weight is 1

Leaf node 24 Character is w Weight is 1

Leaf node 25 Character is x Weight is 1

Leaf node 26 Character is y Weight is 1

Leaf node 27 Character is z Weight is 1

Internal node 28 : Left P(1) Right z(1) Weight = 2

Internal node 29 : Left y(1) Right b(1) Weight = 2

Internal node 30 : Left x(1) Right f(1) Weight = 2

Internal node 31 : Left w(1) Right n(1) Weight = 2

Internal node 32 : Left g(1) Right q(1) Weight = 2

Internal node 33 : Left r(1) Right c(1) Weight = 2

Internal node 34 : Left h(1) Right s(1) Weight = 2

Internal node 35 : Left t(1) Right v(1) Weight = 2

Internal node 36 : Left a(1) Right d(1) Weight = 2

Internal node 37 : Left j(1) Right k(1) Weight = 2

Internal node 38 : Left l(1) Right m(1) Weight = 2

Internal node 39 : Left (2) Right (2) Weight = 4

Internal node 40 : Left (2) Right (2) Weight = 4

Internal node 41 : Left (2) Right u(2) Weight = 4

Internal node 42 : Left (2) Right (2) Weight = 4

Internal node 43 : Left (2) Right (2) Weight = 4

Internal node 44 : Left (2) Right (2) Weight = 4

Internal node 45 : Left e(2) Right o(3) Weight = 5

Internal node 46 : Left i(3) Right (4) Weight = 7

Internal node 47 : Left (4) Right (4) Weight = 8

Internal node 48 : Left (4) Right (4) Weight = 8

Internal node 49 : Left (4) Right (5) Weight = 9

Internal node 50 : Left (7) Right (7) Weight = 14

Internal node 51 : Left (8) Right (8) Weight = 16

Internal node 52 : Left (9) Right (14) Weight = 23

Internal node 53 : Left (16) Right (23) Weight = 39

==== Tree has 53 nodes===============

You can see dot file at C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\5.dot

Run the following command to get pdf file

dot -Tpdf C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\5.dot -o C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\5.dot.pdf

============Code for each character in Pack my box with five dozen liquor jugs ===============

P Has Code 111110

Has Code 110

a Has Code 00100

b Has Code 01101

c Has Code 00011

d Has Code 00101

e Has Code 1010

f Has Code 01111

g Has Code 01010

h Has Code 00000

i Has Code 1110

j Has Code 00110

k Has Code 00111

l Has Code 10000

m Has Code 10001

n Has Code 111101

o Has Code 1011

q Has Code 01011

r Has Code 00010

s Has Code 00001

t Has Code 01000

u Has Code 1001

v Has Code 01001

w Has Code 111100

x Has Code 01110

y Has Code 01100

z Has Code 111111

=======================================

======= Original String========

Pack my box with five dozen liquor jugs

======= Decoded String========

1111100010000011001111101000101100110011011011011101101111001110010000000011001111111001001101011000101101111111110101111011101000011100101110011011000101100011010010101000001

======= Recovered String========

Pack my box with five dozen liquor jugs

Original string cost = 273.0

Decoded string cost = 175.0

% reduction = 35.8974358974359

============ Long years ago we made a tryst with destiny, and now the time comes when we shall redeem our pledge, not wholly or in full measure, but very substantially.At the stroke of the midnight hour, when the world sleeps, India will awake to life and freedom. A moment comes, which comes but rarely in history, when we step out from the old to the new, when an age ends, and when the soul of a nation, long suppressed, finds utterance. +++++++++++++++

A occurs 2 times

I occurs 1 times

L occurs 1 times

occurs 79 times

a occurs 20 times

b occurs 3 times

c occurs 5 times

d occurs 15 times

e occurs 47 times

f occurs 7 times

g occurs 6 times

h occurs 20 times

i occurs 15 times

k occurs 2 times

, occurs 11 times

l occurs 18 times

m occurs 12 times

n occurs 26 times

. occurs 3 times

o occurs 26 times

p occurs 5 times

r occurs 17 times

s occurs 21 times

t occurs 29 times

u occurs 11 times

v occurs 1 times

w occurs 16 times

y occurs 8 times

=======================================

==== Tree built in this order===============

Leaf node 1 Character is A Weight is 2

Leaf node 2 Character is I Weight is 1

Leaf node 3 Character is L Weight is 1

Leaf node 4 Character is Weight is 79

Leaf node 5 Character is a Weight is 20

Leaf node 6 Character is b Weight is 3

Leaf node 7 Character is c Weight is 5

Leaf node 8 Character is d Weight is 15

Leaf node 9 Character is e Weight is 47

Leaf node 10 Character is f Weight is 7

Leaf node 11 Character is g Weight is 6

Leaf node 12 Character is h Weight is 20

Leaf node 13 Character is i Weight is 15

Leaf node 14 Character is k Weight is 2

Leaf node 15 Character is , Weight is 11

Leaf node 16 Character is l Weight is 18

Leaf node 17 Character is m Weight is 12

Leaf node 18 Character is n Weight is 26

Leaf node 19 Character is . Weight is 3

Leaf node 20 Character is o Weight is 26

Leaf node 21 Character is p Weight is 5

Leaf node 22 Character is r Weight is 17

Leaf node 23 Character is s Weight is 21

Leaf node 24 Character is t Weight is 29

Leaf node 25 Character is u Weight is 11

Leaf node 26 Character is v Weight is 1

Leaf node 27 Character is w Weight is 16

Leaf node 28 Character is y Weight is 8

Internal node 29 : Left I(1) Right L(1) Weight = 2

Internal node 30 : Left v(1) Right A(2) Weight = 3

Internal node 31 : Left k(2) Right (2) Weight = 4

Internal node 32 : Left .(3) Right b(3) Weight = 6

Internal node 33 : Left (3) Right (4) Weight = 7

Internal node 34 : Left p(5) Right c(5) Weight = 10

Internal node 35 : Left g(6) Right (6) Weight = 12

Internal node 36 : Left f(7) Right (7) Weight = 14

Internal node 37 : Left y(8) Right (10) Weight = 18

Internal node 38 : Left u(11) Right ,(11) Weight = 22

Internal node 39 : Left m(12) Right (12) Weight = 24

Internal node 40 : Left (14) Right d(15) Weight = 29

Internal node 41 : Left i(15) Right w(16) Weight = 31

Internal node 42 : Left r(17) Right l(18) Weight = 35

Internal node 43 : Left (18) Right a(20) Weight = 38

Internal node 44 : Left h(20) Right s(21) Weight = 41

Internal node 45 : Left (22) Right (24) Weight = 46

Internal node 46 : Left o(26) Right n(26) Weight = 52

Internal node 47 : Left (29) Right t(29) Weight = 58

Internal node 48 : Left (31) Right (35) Weight = 66

Internal node 49 : Left (38) Right (41) Weight = 79

Internal node 50 : Left (46) Right e(47) Weight = 93

Internal node 51 : Left (52) Right (58) Weight = 110

Internal node 52 : Left (66) Right (79) Weight = 145

Internal node 53 : Left (79) Right (93) Weight = 172

Internal node 54 : Left (110) Right (145) Weight = 255

Internal node 55 : Left (172) Right (255) Weight = 427

==== Tree has 55 nodes===============

You can see dot file at C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\6.dot

Run the following command to get pdf file

dot -Tpdf C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\6.dot -o C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\6.dot.pdf

============Code for each character in Long years ago we made a tryst with destiny, and now the time comes when we shall redeem our pledge, not wholly or in full measure, but very substantially.At the stroke of the midnight hour, when the world sleeps, India will awake to life and freedom. A moment comes, which comes but rarely in history, when we step out from the old to the new, when an age ends, and when the soul of a nation, long suppressed, finds utterance. ===============

A Has Code 10100101

I Has Code 101001110

L Has Code 101001111

Has Code 00

a Has Code 11101

b Has Code 0101111

c Has Code 1110011

d Has Code 10101

e Has Code 011

f Has Code 101000

g Has Code 010110

h Has Code 11110

i Has Code 11000

k Has Code 10100110

, Has Code 01001

l Has Code 11011

m Has Code 01010

. Has Code 0101110

n Has Code 1001

o Has Code 1000

p Has Code 1110010

r Has Code 11010

s Has Code 11111

t Has Code 1011

u Has Code 01000

v Has Code 10100100

w Has Code 11001

y Has Code 111000

=======================================

======= Original String========

Long years ago we made a tryst with destiny, and now the time comes when we shall redeem our pledge, not wholly or in full measure, but very substantially.At the stroke of the midnight hour, when the world sleeps, India will awake to life and freedom. A moment comes, which comes but rarely in history, when we step out from the old to the new, when an age ends, and when the soul of a nation, long suppressed, finds utterance.

======= Decoded String========

10100111110001001010110001110000111110111010111110011101010110100000110010110001010111011010101100111010010111101011100011111101100110011100010111111000101010111111110111100010011110000100100111011001101010010011000110010010111111001100101111000010100110011100111000010100111111100110011111001110010011001011001111111110111011101111011001101001110101011011010100010000100011010001110010110110111010101011001101001001001100010110011001111101000110111101111100000100011010001100010010010100001000110111101100010100111110111111010001101001101001000101111010001011001010010001111010111000001111101000010111111111101111101100110111100011101110111101111100001011101010010110110010111111001100111111011110101000101001100110010001010000010111111001100010101100010101100111000010110111101011001111010000100011010010010011001111100111001001011111100110011001100011010110111010100111111101101101111100101111101001001010011101001101011100011101001100111000110111101100111011100111101101001100110010111000001101111000101000011001110110011010100101000110100110111010110000101001011100010100101000101010000101001110011011001110011100001010011111110100100110011111011000111001111110001110011100001010011111110001011110100010110011010111011101001111011111000001100010010011110110001111110111000110101110000100100110011111001110010011001011001111110110111110010001000010001011001010001101010000101000101111110011001000110111010100101110000010111111001100100101111001010010011001111100111001001110110010011101010110011000111001101011111101001001110110011010100110011111001110010010111111001100111111000010001101100100010100000111010010011110110111100010001001010010011011100010010101100011111010001110010111001011010011111111111101110101010010010100011000100110101111110001000101110110111101011101100111100110110101110

======= Recovered String========

Long years ago we made a tryst with destiny, and now the time comes when we shall redeem our pledge, not wholly or in full measure, but very substantially.At the stroke of the midnight hour, when the world sleeps, India will awake to life and freedom. A moment comes, which comes but rarely in history, when we step out from the old to the new, when an age ends, and when the soul of a nation, long suppressed, finds utterance.

Original string cost = 2989.0

Decoded string cost = 1799.0

% reduction = 39.812646370023415

============ Baa, baa, black sheep, have you any wool? +++++++++++++++

occurs 7 times

a occurs 7 times

B occurs 1 times

b occurs 2 times

c occurs 1 times

e occurs 3 times

h occurs 2 times

k occurs 1 times

, occurs 3 times

l occurs 2 times

n occurs 1 times

o occurs 3 times

p occurs 1 times

s occurs 1 times

u occurs 1 times

v occurs 1 times

w occurs 1 times

y occurs 2 times

? occurs 1 times

=======================================

==== Tree built in this order===============

Leaf node 1 Character is Weight is 7

Leaf node 2 Character is a Weight is 7

Leaf node 3 Character is B Weight is 1

Leaf node 4 Character is b Weight is 2

Leaf node 5 Character is c Weight is 1

Leaf node 6 Character is e Weight is 3

Leaf node 7 Character is h Weight is 2

Leaf node 8 Character is k Weight is 1

Leaf node 9 Character is , Weight is 3

Leaf node 10 Character is l Weight is 2

Leaf node 11 Character is n Weight is 1

Leaf node 12 Character is o Weight is 3

Leaf node 13 Character is p Weight is 1

Leaf node 14 Character is s Weight is 1

Leaf node 15 Character is u Weight is 1

Leaf node 16 Character is v Weight is 1

Leaf node 17 Character is w Weight is 1

Leaf node 18 Character is y Weight is 2

Leaf node 19 Character is ? Weight is 1

Internal node 20 : Left B(1) Right c(1) Weight = 2

Internal node 21 : Left k(1) Right v(1) Weight = 2

Internal node 22 : Left w(1) Right ?(1) Weight = 2

Internal node 23 : Left n(1) Right p(1) Weight = 2

Internal node 24 : Left s(1) Right u(1) Weight = 2

Internal node 25 : Left y(2) Right (2) Weight = 4

Internal node 26 : Left (2) Right (2) Weight = 4

Internal node 27 : Left (2) Right l(2) Weight = 4

Internal node 28 : Left b(2) Right h(2) Weight = 4

Internal node 29 : Left (2) Right o(3) Weight = 5

Internal node 30 : Left ,(3) Right e(3) Weight = 6

Internal node 31 : Left (4) Right (4) Weight = 8

Internal node 32 : Left (4) Right (4) Weight = 8

Internal node 33 : Left (5) Right (6) Weight = 11

Internal node 34 : Left a(7) Right (7) Weight = 14

Internal node 35 : Left (8) Right (8) Weight = 16

Internal node 36 : Left (11) Right (14) Weight = 25

Internal node 37 : Left (16) Right (25) Weight = 41

==== Tree has 37 nodes===============

You can see dot file at C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\7.dot

Run the following command to get pdf file

dot -Tpdf C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\7.dot -o C:\Users\Thinkpad\Desktop\CS Study\6205\Assignment9\7.dot.pdf

============Code for each character in Baa, baa, black sheep, have you any wool? ===============

Has Code 111

a Has Code 110

b Has Code 0010

B Has Code 01000

c Has Code 01001

e Has Code 1011

h Has Code 0011

k Has Code 01100

l Has Code 0101

, Has Code 1010

n Has Code 10000

o Has Code 1001

p Has Code 10001

s Has Code 00010

u Has Code 00011

v Has Code 01101

w Has Code 01110

y Has Code 0000

? Has Code 01111

=======================================

======= Original String========

Baa, baa, black sheep, have you any wool?

======= Decoded String========

0100011011010101110010110110101011100100101110010010110011100010001110111011100011010111001111001101101111100001001000111111101000000001110111010011001010101111

======= Recovered String========

Baa, baa, black sheep, have you any wool?

Original string cost = 287.0

Decoded string cost = 160.0

% reduction = 44.25087108013937

=============== Done with Test1 ==================

All Hauffman Test passed. You are great. You should get an award