**Guided Solution for Tutorial 7**

Information Theory and Huffman Coding

1. i) In fixed-length coding, M = 20, hence log2 M = 4.32

Therefore ? bits are required.

ii) Probability of each of the 10 equal-likely keystrokes is 0.07

Probability of each of the other 6 equal-likely keystrokes is 0.01

Probability of each of the remaining 4 equal-likely keystrokes is

(1 -10x0.07 – 6x0.01)/4 = ?

= 10x0.07log2(1/0.07) +4x0.06log2(1/0.06) + 6x0.01log2(1/0.01)

= ? bits/symbol

Code efficiency of the fixed-length code = (Source entropy/ average no. of bits after compression) x 100%

= ? %

**LSB MSB**

2.

(i)

0

E 0.30 0.30 0.43 ?

1.0

0

A 0.27 0.27 0.30 0.43

1

1

0

D 0.19 ? 0.27

1

0

C 0.16 0.19

1

B 0.08

Codeword

E

A

D 11

C

B

(ii)  = ? = 2.24 bits/symbol

(iii) 

= ?

= 2.20 bits/symbols

Code efficiency = = ? = 98.2%