Assignment-06b

Course ID: CSC-301

Section: 1

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Answer to the question no – 1

Prob def; Placeing Probabilities in decending order. We know death percentage. Using Huffman's optical Code formula.

(a) constructed Huffman's optical Code –

Regular code	Huffman cod	Death							
0000	10	0.21 [10]	0.21 [10]	0.21 [10]	0.21 [10]	0.25 [01]	0.34 [00]	0.41 [1]	0.59 [0]
0001	11	.20 [1]	0.20 [11]	0.20 [11]	0.20 [11]	0.21 [10]	0.25 [01]	0.94 [00]	0.41 [1]
0010	001	0.15 [001]	0.15 [001]	0.15 [001]	0.19 [000]	0.20 [11]	0.21 [10]	0.25 [01]	
0011	011	0.12 [011]	0.12 [011]	0.13 [010]	0.15 [001]	0.19 [000]	0.20 [11]		
0100	0000	0.11 [0000]	0.11 [0000]	0.12 [011]	0.13 [010]	0.15 [001]			
0101	0001	0.08 [0001]	0.08 [0001]	0.11 [0000]	0.12 [011]				
0110	0101	0.06 [0101]	0.07 [0100]	0.08 [0001]					
0111	01000	0.05 [01000]	0.06 [0101]						
1000	01001	0.02 [01001]							

(b) code length = 4 ∴ Regular coding Price $(4 \times 1) = 4$

(c) Huffman optical coding Price -

$$= \sum_{J=1}^{m} P_j \, \lambda(c_J)$$

$$= (0.21\times2) + (0.20\times2) + 0.15\times3) + (0.12\times3) + (0.11\times4) + (0.08\times4) + (0.06\times4) + (0.05\times5) + (0.02\times5)$$

$$= 2.98 \quad (\text{Ans})$$

Answer to the question no - 2

Prob def: Placeing Probabilites in desending order. We know the number of attack ~~Use F~~ Their given integer form and sum. Use FANDE'S Nearly optimal code

(a) FANDE'S Nearly optimal code

Regular code	Attack	Percentage				C_J	Length
000	620	0.1854	1 → 11			11	2
001	560	0.1675	1	10 → 101		101	3
010	515	0.154	1	10 → 100		100	3
011	421	0.125	0	01 → 011		011	3
100	360	0.1077	0	01 → 010		010	3
101	320	0.0957	0	00 → 001		001	3
110	285	0.085	0	00	000 → 0001	0001	4
111	263	0.786	0	00	000 → 0000	0000	4

(b) Length 3 ∴ Regular coding Price $(3 \times 1) = 3$

(c) Optical code price,

$= \{(0.1854 \times 2) + (0.1675 \times 3) + (0.154 \times 3) +$
$(0.1259 \times 3) + (0.1077 \times 3) + (0.0957 \times 3)$
$+ (0.0852 \times 4) + (0.786 \times 4)\}$

$= 2.978$ (Ans)

Answer to the question no - 3

Prob def : A code can detect all combinatio of k or fewer errors. The minimum distance between 2 code at least 'k+1'. Correct code minimum distance between 2 code at least 2k+1.

$64 = 2^6$ $\therefore$ Information digit = 6

for 2 error correction and distane = $2k+1 = 2.2+1$
$= 5$

$\therefore$ Prity - check digit $P = 5$

Informational digit $x_1, x_2, x_3, x_4, x_5, x_6$

Parity $x_7, x_8, x_9, x_{10}, x_{11}$

$x_7 = x_1 \oplus x_2 \oplus x_3 \oplus x_4 + x_5 \; (P_1)$

$x_8 = x_1 \oplus x_2 \oplus x_3 \oplus x_4 \oplus x_6 \; (P_2)$

$x_9 = x_1 \oplus x_2 \oplus x_3 \oplus x_5 \oplus x_6 \; (P_3)$

$x_{10} = x_1 \oplus x_2 \oplus x_4 \oplus x_5 \oplus x_6 \; (P_4)$

$x_{11} = x_1 \oplus x_3 \oplus x_4 \oplus x_5 \oplus x_6 \; (P_5)$

$S_1 = \{x_1, x_2, x_3, x_4, x_5, x_7\}$

$S_2 = \{x_1, x_2, x_3, x_4, x_6, x_8\}$

$S_3 = \{x_1, x_2, x_3, x_5, x_6, x_9\}$

$S_4 = \{x_1, x_2, x_4, x_5, x_6, x_{10}\}$

$S_5 = \{x_1, x_3, x_4, x_5, x_6, x_{11}\}$

x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	0	1	1	1	1
0	0	0	0	1	0	1	0	1	1	1
0	0	0	0	1	1	1	1	0	0	0
0	0	0	1	0	0	1	1	0	1	1
0	0	0	1	0	1	1	0	1	0	0
0	0	0	1	1	0	0	1	1	0	0
0	0	0	1	1	1	0	0	0	1	1
0	0	1	0	0	0	1	1	1	0	1
0	0	1	0	0	1	1	0	0	1	0
0	0	1	0	1	0	0	1	0	1	0
0	0	1	0	1	1	0	0	1	0	1
0	0	1	1	0	0	0	0	1	1	0
0	0	1	1	0	1	0	1	0	0	1
0	0	1	1	1	0	1	0	0	0	1
0	0	1	1	1	1	1	1	1	1	0
0	1	0	0	0	0	1	1	1	1	0
0	1	0	0	0	1	1	0	0	0	1
0	1	0	0	1	0	0	1	0	0	1
0	1	0	0	1	1	0	0	1	1	0
0	1	0	1	0	0	0	0	1	0	1
0	1	0	1	0	1	0	1	0	1	0
0	1	0	1	1	0	1	0	0	1	0
0	1	0	1	1	1	1	1	1	0	1
0	1	1	0	0	0	0	0	0	1	1
0	1	1	0	0	1	0	1	1	0	0
0	1	1	0	1	0	1	0	1	0	0
0	1	1	0	1	1	1	1	0	1	1

x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}
0	1	1	1	0	0	1	1	0	0	0
0	1	1	1	0	1	1	0	1	1	1
0	1	1	1	1	0	0	1	1	1	1
0	1	1	1	1	1	0	0	0	0	0
1	0	0	0	0	0	1	1	1	1	1
1	0	0	0	0	1	1	0	0	0	0
1	0	0	0	1	0	0	1	0	0	0
1	0	0	0	1	1	0	0	1	1	1
1	0	0	1	0	0	0	0	1	0	0
1	0	0	1	0	1	0	1	0	1	1
1	0	0	1	1	0	1	0	0	1	1
1	0	0	1	1	1	1	1	1	0	0
1	0	1	0	0	0	0	0	0	1	0
1	0	1	0	0	1	0	1	1	0	1
1	0	1	0	1	0	1	0	1	0	1
1	0	1	0	1	1	1	1	0	1	0
1	0	1	1	0	0	1	1	0	0	1
1	0	1	1	0	1	1	0	1	1	0
1	0	1	1	1	0	0	1	1	1	0
1	0	1	1	1	1	0	0	0	0	1
1	1	0	0	0	0	0	0	0	0	1
1	1	0	0	0	1	0	1	1	1	0
1	1	0	0	1	0	1	0	1	1	0
1	1	0	0	1	1	1	1	0	0	1
1	1	0	1	0	0	1	1	0	1	0
1	1	0	1	0	1	1	0	1	0	1
1	1	0	1	1	0	0	1	1	1	1
1	1	0	1	1	1	0	0	0	0	0
1	1	1	0	0	0	1	1	1	0	0

x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}
1	1	1	0	0	1	1	0	0	1	1
1	1	1	0	1	0	0	1	0	1	1
1	1	1	0	1	1	0	0	1	1	0
1	1	1	1	0	0	0	0	1	1	1
1	1	1	1	0	1	0	1	0	0	0
1	1	1	1	1	0	1	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1

If a word recived, we check P_1, P_2, P_3, P_4, P_5 the word.

intersection $= \{S_1 \mid \overline{S_1}\} \cup \{S_2 \mid \overline{S_2}\} \cup \{S_3 \mid \overline{S_3}\} \cup \{S_4 \mid \overline{S_4}\} \cup \{S_5 \mid \overline{S_5}\}$ we take $P_1 =$ false

else we take S_i

(!) 11000 | 10001 arrives

then $P_1 =$ True, $P_2 =$ True, $P_3 =$ True,

$P_4 =$ True, $P_5 =$ False

$$\{\overline{S_1} \cap \overline{S_2} \cap \overline{S_3} \cap \overline{S_4} \cap S_5\}$$

$$= \{x_6, x_8, x_9, x_{10}, x_{11}\} \cap \{x_5, x_7, x_9, x_{10}, x_{11}\}$$

$$\cap \{x_4, x_7, x_8, x_{10}, x_{11}\} \cap \{x_3, x_7, x_8, x_9, x_{11}\}$$

$\cap \{x_2, x_3, x_4, x_5, x_6, x_{11}\}$

$= x_{11}$

(ii) 111111 00000

then P_1 = False, P_2 = False, P_3 = False, P_4 = False, P_5 = False

$\therefore \{S_1 \cap S_2 \cap S_3 \cap S_4 \cap S_5\}$

Conclusion :

(i) Find the Huffman code. Using rules we find coding Price and optical coding price.

(ii) Using formula find Nanoe's code, regular coding price and nearby optical coding.

(iii) Find error detection and error correction for 64 code word.