CS & IT ENGINEERING



By-Ankit Doyla Sir



Error Control

Lecture No-8





TOPICS TO BE COVERED

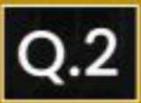
Hamming code



Problem Solving on Hamming Code

Q.1

If a 7 bit hamming code word received by receiver is 1011011.\(^1\) assume even parity state whether the received code word is correct or not ?if it is incorrect then locate the bit having error.





Assume that a 12-bit Hamming codeword consisting of 8-bit data and 4 check bits is $d_8d_7d_6d_5c_8$ $d_4d_3d_2c_4d_1c_2c_1$, where the data bits

and check bits are given in

CAT	F-2001	(an)
410	- 40-11	(qt)

		I	ata	bits	3		
d ₈	d_7	d_6	d_5	d_4	d_3	d_2	d_1
1	1	0	\mathbf{x}	0	1	0	1

Check bits					
c ₈	c ₄	c ₂	c_1		
у	0	1	0.		

Which one of the following choices gives the correct values of x and y?



x is 1 and y is 0



x is 1 and y is 1



x is 0 and y is 0



x is 0 and y is 1

```
C1 C2 3 C4 5 6 7 C8 9 10 11 12
0 1 1 0 0 1 0 4 8 0 1 1
```

$$\frac{C_{2}}{23671011}$$
 $\frac{1}{110011}$
 $\frac{1}{110011}$
 $\frac{1}{1100011}$



Q.3

Consider hamming code (Signal bit error detection and correction technique), the minimum parity bits needed for 60 data bits is _____.

$$8=6 \Rightarrow 60+6+1 \leq 2^{6}$$
, $67 \leq 64(N_{0})$
 $8=7 \Rightarrow 60+7+1 \leq 27$, $68 \leq 128(40.8)$

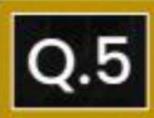


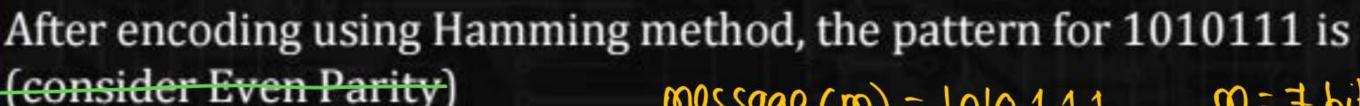


$$m = 12$$
, (odelingth(n) = $m+8 = 12+5 = 17$

$$M+\delta+1\leq 2^{\delta}$$

$$8=4 \rightarrow 19+4+1 \le 94$$
, $17 \le 16(N0)$
 $8=5 \rightarrow 19+5+1 \le 95$, $18 \le 39(48)$
 $8=5$











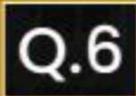






Transmitted data = 101101011111

Note "odd Parity is preterable over even parity"



Identify valid 7 bit hamming code.(by using odd parity)



- A. 0110011
- B. 1011011
- G Both A & B
- D. None of these

$$\frac{P_1}{1357}$$
0 1 0 1 - reven





Checksum

Checksum = (4bit, 8bit, 16bit, 39bit)
(TCP|IP)

Let us assume checksum = 4 bit





$$\frac{\text{Checksym} = 36 = 100100}{0110} \rightarrow 6$$
(9) \(\tau \) 1001 \(\frac{1}{2} \) Complement

9F Received Received uncoossupted data





Suppose that a message 1001 1100 1010 0011 is transmitted using internet checksum (4-bit word). What is the value of the checksum in binary?

Hns: 1011

