NAME OF STUDENT:	CLASS:
SEMESTER/YEAR:	ROLL NO:
DATE OF PERFORMANCE:	DATE OF SUBMISSION:
EXAMINED BY:	EXPERIMENT NO:

ASSIGNMENT NO -4

Title: To demonstrate error detection and correction using Hamming Codes or CRC

Objectives : To implement error detection and correction techniques

Problem Statement: Write a program for error detection and correction for 7/8 bits ASCII codes using Hamming Codes or CRC. Demonstrate the packets captured traces using Wireshark Packet Analyzer Tool for peer to peer mode.

Outcome : Demonstrate Hamming Codes or CRC with example.

Software Requirements : Jdk and wireshark

Hardware Requirements : Open source linux operating system.

THEORY:
Cyclic Redundancy Check: CRC
- Given a k-bit frame or message,   the transmitter generates an n-bit sequence, known as a   frame check sequence (FCS), so that   the resulting frame, consisting of (k+n) bits, is exactly divisible by some predetermined number.
- The receiver   then divides the incoming frame by the same number   and, if there is no remainder, assumes that there was no error.

Hamming code

- **Hamming codes are a family of linear error-correcting codes that generalize the Hamming(7,4)-code**

- **Invented by Richard Hamming in 1950**

Hamming codes can detect up to two-bit errors or correct one-bit errors without detection of uncorrected errors.

General algorithm

- **The following general algorithm generates a single-error correcting (SEC) code for any number of bits.**

- **Number the bits starting from 1: bit 1, 2, 3, 4, 5, etc.**

- **Write the bit numbers in binary: 1, 10, 11, 100, 101, etc.**

- **All bit positions that are powers of two (have only one 1 bit in the binary form of their position) are parity bits: 1, 2, 4, 8, etc. (1, 10, 100, 1000)**

- **All other bit positions, with two or more 1 bits in the binary form of their position, are data bits.**

- **Each data bit is included in a unique set of 2 or more parity bits, as determined by the binary form of its bit position.**

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  Each data bit is included in a unique set of 2 or more parity bits, as determined by the binary form of its bit position.

  - **Parity bit 1 covers all bit positions which have the least significant bit set: bit 1 (the parity bit itself), 3, 5, 7, 9, etc.**

  - **Parity bit 2 covers all bit positions which have the second least significant bit set: bit 2 (the parity bit itself), 3, 6, 7, 10, 11, etc.**

  - **Parity bit 4 covers all bit positions which have the third least significant bit set: bits 4–7, 12–15, 20–23, etc.**

  - **Parity bit 8 covers all bit positions which have the fourth least significant bit set: bits 8–15, 24–31, 40–47, etc.**

  - **In general each parity bit covers all bits where the bitwise AND of the parity position and the bit position is non-zero.**

Error correction

ERROR DETECTION

The bit in position 7 is in error.
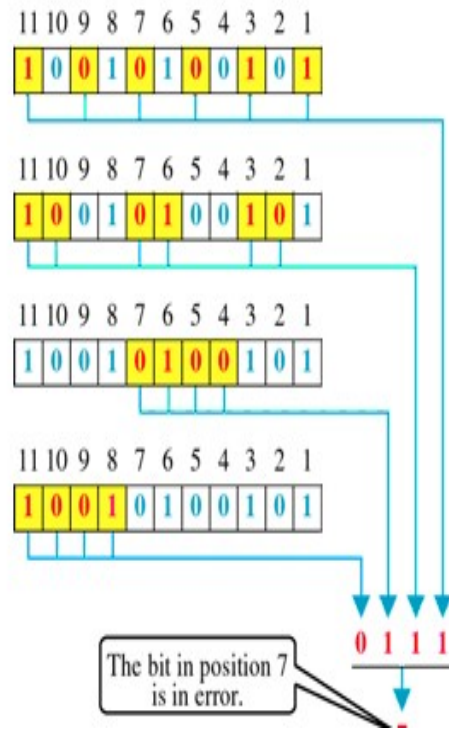
Conclusion: Hence we have implemented CRC and Hamming code.

Questions

1)What is CRC? Explain CRC generator and checker with example.

2)What is hamming code? Generate hamming code for 7/8 bit data word.

3) Explain checksum in detail