**Home Assignment – Computer Networks**

**Instructions:**

- Submission Date: The assignment must be submitted on or before **13th November 2024**.

- Format: The assignment must be handwritten on A4 paper, with a printed/photocopied top sheet that includes:

  - Name

  - Enrollment Number

  - Paper Name

  - Paper Code

  - Section

  - SNU Logo (at the top of the sheet)

- Students may submit a soft copy, but they must submit the hard copy on or before the end semester practical examination.

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Assignment Questions:

**Data Link Layer**

1. Parity Check

Suppose you are using even parity for error detection. Given the data byte `11010101`, determine the parity bit that would be appended to ensure even parity. Explain the process.

2. Cyclic Redundancy Check (CRC)

A 7-bit data string `1011101` is to be transmitted using a CRC generator polynomial `1011`. Calculate the CRC code that should be appended to the data for error detection. Show all steps in the division process.

3. Checksum Calculation

Given two 8-bit data values: `10111010` and `11000111`, calculate the checksum value that would be appended to detect errors. Explain how the checksum works in detecting transmission errors.

4. Single-Bit Error Detection Using Hamming Code

Given a 4-bit data sequence `1011`, use single-bit Hamming code to generate the codeword with the necessary parity bits. Describe how the parity bits are determined and show the final encoded sequence.

5. Error Detection Using Hamming Code (Single-Bit Correction)

A transmitted Hamming code `1101001` is received, but errors may have occurred in transmission. Using single-bit error correction, determine if an error occurred and, if so, correct it. Show each step clearly.

**Network Layer - IP Addressing**

6. Class Identification

Identify the IP class of the following IP address: `193.168.4.5`. Briefly explain why it belongs to that class.

7. Subnetting Calculation

Given an IP address `192.168.10.0/24`, divide this network into four equal subnets. Provide the subnet addresses, subnet masks, and range of IP addresses in each subnet.

8. IP Address Analysis

Given the IP address `172.16.3.255` with subnet mask `255.255.255.0`, identify if this is a network address, broadcast address, or a host IP. Explain your reasoning.