**Class:** Final Year (Computer Science and Engineering)

**Year:** 2021-22 **Semester:** 1

**Course:** High Performance Computing Lab

**Practical No. 6**

**Exam Seat No:**

1. 2018BTECS00088 – Abhishek Bhagate

**Problem Statement 1:**

Q1: Study the gather and scatter functions of MPI.

**Information 1:**

The scatter function of MPI – MPI\_Scatter is very similar to MPI\_Bcast in the sense that it broadcasts the message to all processes in a communicator but has a small difference. While the MPI\_Bcast will send the same copy of message data to all the process, MPI\_Scatter, on the other hand, will send chunks of an array to different process. It takes an array of elements and distributes the elements in the order of process rank. The function prototype is as follows –

MPI\_Scatter(

    void\* send\_data,

    int send\_count,

    MPI\_Datatype send\_datatype,

    void\* recv\_data,

    int recv\_count,

    MPI\_Datatype recv\_datatype,

    int root,

    MPI\_Comm communicator

)

The gather function of MPI – MPI\_Gather is opposite of the function MPI\_Scatter. It gathers the data from various processes into a single process. In a similar way that MPI\_Scatter spreads data from root to all processes in communicator, MPI\_Gather will group data from all processes to the root.

MPI\_Gather(

    void\* send\_data,

    int send\_count,

    MPI\_Datatype send\_datatype,

    void\* recv\_data,

    int recv\_count,

    MPI\_Datatype recv\_datatype,

    int root,

    MPI\_Comm communicator

)

**Problem Statement 2:**

Q2. Execute the all-to-all broadcast operation (Program C) with varying message sizes.

Plot the performance of the operation with varying message sizes from 1K to 10K (with

constant number of processes, 8). Explain the performance observed.

**Screenshot 1:**

**Chart, line chart

Description automatically generated**

**Information 1:**

The time taken initially increases as we increase message size and then decrease and remains constant after a certain point.

**Problem Statement 3:**

Q3. Execute the all-reduce operation (Program D) with varying number of processes (1

to 16) and fixed message size of 10K words. Plot the performance of the operation with

varying number of processes (with constant message size). Explain the performance

observed.

**Screenshot 1:**

**Chart, line chart, scatter chart

Description automatically generated**

**Information 1:**

The time taken increases as the number of processes increase in almost linear fashion.

**Github Link:**

https://github.com/archit81/HPC-Lab-Assignments/tree/main/Assignment%20-%20V