



VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of U.O. Act 1956)

SCHOOL OF COMPUTER SCIENCE AND ENGINEERING

Continuous Assessment Test - II, September 2018

B.Tech(Common to all Faculty), Fall Semester -2018-19

Course Code	: CSE4001	Duration	: 90 Minutes.
Course Name	: Parallel and Distributed Computing	Max. Marks	: 50
School	: SCOPE	Slot	: B2

Answer All the Questions

(5*10=50 Marks)

1. Consider the bucket-sort algorithm. Given an array A of n random integers in the range [1...r] as input, output data consist of r buckets, such that at the end of the algorithm, Bucket i contains indices of all the elements in A that are equal to i.
 - (i) Describe a decomposition based on partitioning the input data (i.e., the array A) and an appropriate mapping onto p processes. (3)
 - (ii) Describe a decomposition based on partitioning the output data (i.e., the set of r buckets) and an appropriate mapping onto P processes. (3)
 - (iii) Explain how the resulting parallel algorithm would work. (4)
2. (a) Given the following program parallelized with Open MP:

```
double calculate_pi(double step) {
    int i;
    double x, sum = 0.0;
    #pragma omp parallel for reduction (+: sum) private(x)
    for (i=0; i<1000000; ++i) {
        x = (i-0.5) * step;
        sum += 2.0 / (1.0 + x*x);
    }
    return step * sum;
}
```

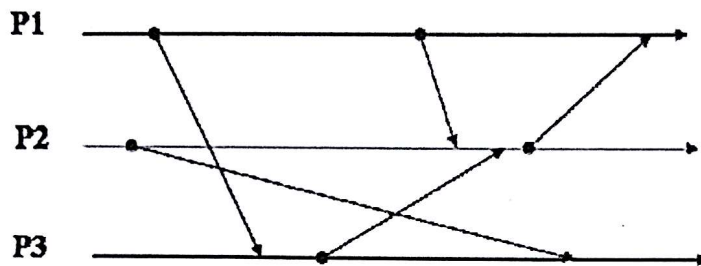
Write an equivalent version of the program without the reduction annotation. (4)
- ✓(b) Identify the key differential factors for the following MPI primitives with suitable communication scenario. → Ex. (6)
 - (i). Blocking vs. Non-Blocking Primitives
 - (ii). Buffered vs. Unbuffered Primitives
 - (iii). Reliable vs. Unreliable Primitives

3. (a) Identify the main features of Java RMI. Discuss its various components and processes of RMI execution. (8)

(b) Analyze the significances of TCP and UDP protocol in terms of reliability, flow control and use of sockets. (2)

4. (a) What is the structure used to maintain logical time in the Fidge/Mattern scheme of vector clocks. What are the update rules for this structure? (2)

(b) Consider the following event diagram for processes P1, P2 and P3 executing in a distributed system.



(4)

Compute the vector that is piggybacked on each message.

(c) The vector clock method has the drawback of high message overhead when the number of processes are large. Briefly discuss one possible method to reduce the overhead of message transmission in vector clocks. (2)

(d) Using the above diagram, illustrate (a) a consistent cut and (b) an inconsistent cut. (2)

5. (a) A client's clock reads 7:30:00. The server's clock reads 7:20:00 when they synchronize using the Cristian's algorithm. Assume message delays are negligible. What is the time at the client after synchronization? (3)

(b) Assume there are four processes, P0, P1, P2, and P3, running Maekawa's algorithm for mutual exclusion. The voting sets are as follows:

Process	Voting Set
P0	P1,P3
P1	P0,P2
P2	P1,P3
P3	P0,P2

Using the four processes and their voting sets, describe a concrete scenario (i.e., a step by step action sequence) where Maekawa's algorithm does not provide liveness. (7)