

Master of Computer Applications
MCAC402: Parallel and Distributed Computing
Unique Paper Code: 223401403

Semester IV

May-June-2022

Year of admission: 2020

Time: 3:30 Hours

Max Marks: 70

Instructions for the Students:

Attempt any 7 out of 8 questions.

1. a. Discuss how distributed system is more scalable than the centralized systems. 3

- b. What is meant by Bernstein condition? Using Bernstein's condition, detect maximum parallelism between the instructions of the following code: 2+5

$$P_1 : A = B * C$$

$$P_2 : P = Q + A$$

$$P_3 : R = T + A$$

$$P_4 : A = S + P$$

$$P_5 : V = Q \div C$$

2. a. What is meant by the inter-process communication? List two methods supported by an operating system for inter-process communication. 3

- b. With the help of a neat diagram, illustrate the procedure for matrix multiplication using Hypercube SIMD model for the following matrices. 7

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

$$B = \begin{bmatrix} -5 & -6 \\ 7 & 8 \end{bmatrix}$$

$$\begin{array}{cc} 1 & 2 \\ 3 & 4 \end{array} \quad \begin{array}{cc} -5 & -6 \\ 7 & 8 \end{array}$$

$$\begin{array}{cc} -5+4 & -6+16 \\ -15+28 & -12+32 \end{array}$$

$$\begin{array}{cc} 9 & 10 \\ 13 & 4 \end{array}$$

3. a. Would it make sense to limit the number of threads in a server process? 3
State the reason for your answer.
- b. Write pseudocode for performing an even-odd transportation sort on a linear array of n processors. What is the overall time complexity? 7
Illustrate the sorting process for the following sequence of 8 numbers:
3, 1, 9, 7, 5, 2, 0, 6
4. a. Explain why virtualization plays a crucial role in distributed system? 5
- b. A program has only two modes of operation; purely sequential mode for 20% of the program and fully parallel for the remaining program. The program is run on a multiprocessor system having only 8 processors. Find the maximum speed up? 5
5. a. Write pseudocode for MPI application interface to create two processes. 5
One process reads a number from the terminal and passes the number as a message to another process. The second process prints the number on the terminal.
- b. Explain the role of replication and fault tolerance in distributed system? 5
6. a. We want to evaluate the following expression for seven sets of values: 5
 $A_i * B_i + C_i$, for $i = 1, 2, 3, \dots, 7$. Each sub operation can be implemented by a different segment of registers within the pipeline. List the steps for evaluation.
- b. Explain different models on the basis of software components and their placement in distributed systems. 5

7. a. Explain the Remote Procedural call (RPC) mechanism along with various functional components. 4

b. Illustrate Flynn's classification of parallel computer systems? List salient features of all categories. 6

8. Consider election algorithm based on the following situation and find the new coordinator of the system: 10

Initially total 8 processors are cooperating and are arranged based on their priorities as follows (0-7)

- After sometime, processor 7 crashes
- And process 4 starts sending election messages

How you will choose an appropriate election algorithm, for electing a coordinator, comment?

Department of Computer Science (University of Delhi)

Minor Exam- March 2022

Subject: Parallel and Distributed Computing

Date: 23/03/2022 Time: 1 Hours

All questions are compulsory

1. Illustrate the client server architecture of one or more internet applications.
2. Differentiate the wrappers and interceptors in distributed system.
3. What is difference between tightly coupled architecture and loosely coupled architecture?
4. Using Bernstein's conditions, detect maximum parallelism between the instructions of the following code:

P1: $A = B * C$

P2: $P = Q + A$

P3: $R = T + A$

P4: $A = S + P$

P5: $V = Q \div C$

5. Differentiate between Control flow computing and Data-flow computing. Also give example for each.