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

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

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

3. a. Would it make sense to limit the number of threads in a server process? State the reason for your answer. 3

b. Write pseudocode for performing an even-odd transportation sort on a linear array of n processors. What is the overall time complexity? Illustrate the sorting process for the following sequence of 8 numbers: 3, 1, 9, 7, 5, 2, 0, 6 7

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. 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. 5

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: Ai*Bi+ Ci, for i = 1, 2, 3, …, 7. Each sub operation can be implemented by a different segment of registers within the pipeline. List the steps for evaluation. 5

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?