MASTER OF COMPUTER APPLICATIONS (MCA) (REVISED)

Term-End Examination

December, 2023

MCSE-011 : PARALLEL COMPUTING

Time : 3 Hours   *Maximum Marks : 100*

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Note : *Question No. **1** is compulsory. Attempt any **three** questions from the rest.*

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1. (a) State the Bernstein's conditions for parallelism. Apply the conditions to detect parallelism in the following set of instructions of a program : 8

$$S_1 : C = D \times E$$
$$S_2 : M = G + C$$
$$S_3 : A = B + C$$
$$S_4 : C = L - M$$
$$S_5 : F = G \div E$$

(b) What are Parallel Random Access Machines (PRAM) ? List the steps followed by PRAM model in executing an algorithm. 8

(c) What is MPI ? Briefly, discuss the utility of MPI. Discuss the features of MPI-I and MPI-II. 8

(d) List and explain the metrics involved in the analysis of the performance of parallel algorithms for parallel computers. 8

(e) Discuss perfect shuffle and butterfly permutations with the help of suitable example for each. 8

2. (a) What are interconnection networks ? Discuss the properties associated with interconnection networks with the help of examples. 10

(b) Briefly discuss the requirement of synchronization in parallel systems. How is synchronization achieved through wait protocol and sole access protocol ? Discuss. 10

3. (a) Explain the concept of speed up by applying Amdahl's law. Determine speed up under the following situations :   10

   (i) When no part of the code is parallelized.

   (ii) When 50% of the code is parallelized.

   (iii) When no. of processors are added to perform fraction of work in parallel.

   (b) What are Pipeline Processors ? Classify the pipeline processors and explain each classification in detail with example.   10

4. (a) Why are performance metrics not able to achieve a linear curve in parallel computer ? Discuss the well-known services of overheads in a parallel computer.   10

(b) Briefly discuss the terms 'Bisection Bandwidth' and 'Network Diameter'. Give significance of both.   10

5. Write short notes on the following :   4×5=20

(a) NUMA

(b) UMA

(c) Handler's classification

(d) Hypercube

(e) Benz Network