

**MASTER OF COMPUTER
APPLICATIONS (MCA) (REVISED)
Term-End Examination
December, 2025
MCSE-011 : PARALLEL COMPUTING**

Time : 3 Hours

Maximum Marks : 100

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

1. (a) Explain the concept of Data Parallelism with suitable example. 5
- (b) Briefly discuss the classification of parallel computers on the basis of instruction and data streams. 5
- (c) Differentiate between Static and Dynamic Interconnection network. 5
- (d) Explain the term “Pipelining” in context of parallel processing. How does scalar pipelining differ from vector pipelining ? 5

- (e) List the fundamental parameters required for the analysis of parallel algorithms. Briefly discuss any *one* of the listed parameters. 5
- (f) Describe Arrays as a data structure for parallel algorithms, with suitable example. 5
- (g) How does shared memory programming differ from the programming based on data parallelism ? 5
- (h) How does concurrent environment differ from parallel environment ? Give suitable example for each. 5
2. (a) List and explain various metrics used for the performance analysis of parallel algorithms. 7
- (b) Write and explain Gustafson's law. 8
- (c) Briefly discuss the term cluster computing. 5
3. (a) Describe the term "Program", "Process" and "Thread" with suitable example for each. 7

- (b) Compare instruction level, loop level, procedure level and program level of parallel processing. 8
- (c) What do you understand by “Dimensionality of interconnection network”. Differentiate between “Broadcast” and “Multicast” in context of interconnection network. 5
4. (a) Write Bernstein conditions for Detection of Parallelism. Consider the following instructions of sequential program
 $I_1 : x (a + b)/(a * b); I_2 : y = (b + c) * d;$
 $I_3 : z = x^2 + (a * e)$
Use Bernstein conditions to identify which pair of Instructions can be executed in parallel and which pair cannot be executed in parallel. 8
- (b) Describe the stages of an instruction pipeline. Also, draw a diagram to show the connectivity between the stages of instruction pipeline. 7
- (c) Briefly discuss the multithreaded processors. 5

5. Write short notes on following : 20

- (a) VLIW Architecture
- (b) Merits and Demerits of Message passage programming
- (c) Sole Access Protocol
- (d) Sun and Ni's law

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