

# CBCS SCHEME

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18CS732

## Seventh Semester B.E. Degree Examination, Jan./Feb. 2023 High Performance Computing

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Explain in detail the diverse applications of parallel computing. (10 Marks)
- b. List and explain four major limitations of Memory System Performance. (10 Marks)

OR

- 2 a. With a neat diagram, describe the classification of interconnection networks. (10 Marks)
- b. Discuss the following routing techniques used in parallel computers:
  - i) Store-and-Forward Routing
  - ii) Packet Routing(10 Marks)

### Module-2

- 3 a. Explain the various schemes of static mapping for load balancing. (10 Marks)
- b. Briefly discuss the following parallel algorithm models.
  - i) Data-parallel model
  - ii) Task Graph Model.(10 Marks)

OR

- 4 a. Illustrate with a neat diagram and algorithm, the computation of prefix\_sums on an eight node hypercube. (10 Marks)
- b. Explain All-to-All Broadcast and Reduction communication operation, on an eight-node ring. (10 Marks)

### Module-3

- 5 a. List and explain performance metrics for parallel systems with example to each. (10 Marks)
- b. Explain with prototypes and examples the send and receive operations of message passing programming paradigm. (10 Marks)

OR

- 6 a. Explain the following MPI operations with respect to collective communication and computations:
  - i) Barrier
  - ii) Broadcast
  - iii) Reduction
  - iv) Gather
  - v) Scatter(10 Marks)
- b. With an example describe the general method in MPI for partitioning group of processes. (10 Marks)

### Module-4

- 7 a. Give the general form the schedule directive of OpenMP and also explain the usage of four scheduling classes. (10 Marks)
- b. With an example, explain usage of following directives in OpenMP:
  - i) Sections Directive
  - ii) Merging Directive
  - iii) Nesting Parallel Directive.(10 Marks)

**OR**

- 8 a. With a diagram, explain the communication steps in Canon's matrix-matrix multiplication algorithm on 16 processes. (10 Marks)  
b. With an illustrate example, explain the sorting of n elements using a Bitonic sorting network. (10 Marks)

**Module-5**

- 9 a. Explain the Source-Partitioned parallel formulation of Dijkstra's algorithm for solving all pairs shortest paths. (10 Marks)  
b. Discuss with example, finding a Maximal Independent Set (MIS) of vertices of a graph. (10 Marks)

**OR**

- 10 a. With neat diagram explain a generic scheme for dynamic load balancing. (10 Marks)  
b. Discuss with a neat diagram, a message passing implementation of parallel best-first search using the ring communication strategy. (10 Marks)

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