

(Time: 3 Hours)

[Total Marks 80]

N. B:

1. Question No. 1 is Compulsory.
2. Solve any THREE from Question No. 2 to 6.
3. Draw neat well labeled diagram wherever necessary.

- Q. 1 a) What are the applications of parallel computing? (5)
- b) What are the principles of Message Passing Programming. (5)
- c) Explain Non-Blocking Communication using MPI. (5)
- d) Explain the cube Interconnection networks. (5)
- Q. 2 a) Write a MPI program for prime number generation. (10)
- b) What is a Data Race? Why Data-Races are Undesired? How Data-Races Can be Prevented? (10)
- Q. 3 a) Short note on 'SIMD matrix multiplication'. (10)
- b) Explain SIMD, MIMD and SIMT architecture. (10)
- Q. 4 a) With neat block diagram explain in detail about the various programmatic levels of parallel processing. (10)
- b) State Amdahl's law?  
Suppose a serial program reads  $n$  data from a file, performs some computation, and then writes  $n$  data back out to another file. The I/O time is measured and found to be  $4500 + n$   $\mu$ sec. If the computation portion takes  $n/200$   $\mu$ sec, what is the maximum speedup we can expect when  $n=10,000$  and  $p$  processors are used? (10)
- Q. 5 a) Explain in brief Quantum Computers. (10)
- b) What are the different Performance metrics. (10)
- Q. 6 Solve any FOUR: (20)
1. Write a short note on data flow model.
  2. Explain Granularity, Concurrency and dependency graph.
  3. Explain Various techniques in decomposition.
  4. What is meant by grain packing and scheduling in parallel Processing.
  5. What are the characteristic of tasks and interactions?