Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech (CSE)/SEM-2/CS-1003/2011

2011

PARALLEL AND DISTRIBUTED ARCHITECTURES

Time Allotted : 3 Hours Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions. 5 × 14 = 70

1. a) Classify parallel computers according to Flynn.

   b) Briefly explain the characteristics of each type of above parallel processors with clear diagram.

   c) Make a comparison among merits and demerits of different parallel systems mentioned above. 2 + 8 + 4

2. a) Explain the following performance measures for a computing system :

      i) MIPS rate

      ii) Throughput.

b) What kind of processing is nicely supported by an SIMD machine ?

c) Write down a tuple description of an SIMD machine and explain each component with diagram. 4 + 2 + 8

3. a) What are static and dynamic interconnection networks ? Mention their importance.

b) Draw some common static interconnection networks and compute their diameter when number of nodes in each case is 16.

c) Draw a 4-cube network and assign addresses to each node. 4 + 6 + 4

4. a) In case of one-to-one mapping, how many states can a logical switch assume ? What are their names ?

b) Draw a cube switching network with 8 nodes and describe its addressing and routing strategies.

c) Show that a 3-stage cube network is non-recirculating and the maximum switching complexity is $\log_2 N$ where N = No. of nodes. 4 + 5 + 5

5. a) Describe different strategies for improving performance of uniprocessor systems with diagram and explanations.

   b) How can you compute the following performance measures of a system ?

      i) Speed up

      ii) Efficiency

      iii) Throughput.

   c) In a mainframe system 10 jobs can be loaded at a time in batch mode. Assume each job has execution time of 50 minutes and job loading time of 2 minutes. Computer the batch mode speedup. 5 + 5 + 4

6. a) What are the requirements of a system for executing a parallel program ?

   b) Write down a parallel program (algorithm only) for performing multiplication of two matrices of size $n \times n$ in a mesh connected network. Explain your procedure clearly.

   c) Compare the complexity of the algorithm with a serial version. 2 + 8 + 4

7. a) Define vector data and vector processing.

   b) Show diagrammatically the execution schemes for different types of vector instructions.

   c) Write down the properties of a vector pipeline and show the operation of a multipipeline vector processor. 2 + 6 + 6

8. Write short notes of any *two* of the following : 2 × 7

   a) Role of average parallelism in computing speedup.

   b) Permutations of routing functions in switching networks.

   c) Spatiotemporal parallelism in pipelines.

   d) Single stage recirculating switching networks.