

MCA (Revised)
Term-End Examination

00425

December, 2016

MCSE-011 : PARALLEL COMPUTING

*Time : 3 hours**Maximum Marks : 100*

Note : Question number 1 is compulsory. Attempt any three questions from the rest.

1. (a) State the Bernstein's Parallelism condition and apply it to detect the parallelism in the following instructions of a program : 10

$$S_1 : C = D \times E$$

$$S_2 : M = G + C$$

$$S_3 : A = B + C$$

$$S_4 : C = L - M$$

$$S_5 : F = G \div E$$

- (b) Consider an unsorted list having the element values as

(3, 6, 9, 12, 15, 18, 21, 40, 35, 30, 25, 20, 17, 11, 7, 2).

Illustrate the concept of sorting the above numbers using the comparators and explain. 10

- (c) Show the relationships diagrammatically between the following and explain : 6
- Number of Processors vs Execution time
 - Number of Processors vs Speed-up
 - Number of Processors vs Efficiency
- (d) What are the problems encountered in superscalar architecture ? Discuss. 4
- (e) What is the major shortcoming identified in Amdahl's law ? Explain. 4
- (f) What is a non-blocking network ? Draw the organisation of CIOS network and describe its architecture. 6
2. (a) Discuss the three types of dependency conditions among instructions in a program. What types of dependency relationships exist among the following instructions ? 10
- $$A = B + C + D$$
- $$B = C + E$$
- $$X = B/G$$
- (b) Explain the algorithm for matrix multiplication for parallel computational model. What is its complexity ? 10

3. (a) Discuss the following issues in the design of an interconnection network : 6
- Dimension and size of the network
 - Symmetry of the network
 - Data transfer time
- (b) Draw the following interconnection networks and describe their properties : 4
- Crossbar network
 - Ring network
- (c) Explain Gustafson's law. How is it different from the other two laws, Amdahl's law and Sun-Ni's law ? 10
4. (a) Draw an arithmetic pipeline for floating point addition of two numbers and explain the process. 6+1=7
- (b) What are the factors which limits the speed-up in the pipeline ? 3
- (c) Discuss the following parallel programming models : 6
- Shared memory model
 - Threads model
 - Message passing model

(d) Elaborate on the following performance analysis tools : 4

(i) Visualization

(ii) Communication matrix

5. Explain the following terms : 20

(a) Cluster Computing

(b) Master Slave Kernel

(c) System Deadlock

(d) Parallel Random Access Machine

(e) Instruction Level and Loop Level Parallelism
