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Total Number of Pages : 02

MCA  
MCA506B

5<sup>th</sup> Semester Regular Examination 2019-20

PARALLEL COMPUTING

BRANCH : MCA

Max Marks : 100

Time : 3 Hours

Q.CODE : HR433

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Only Short Answer Type Questions (Answer All-10) (2 x 10)

- a) Explain Amdahl's law in brief.
- b) How message routing is performed in E-Cube routing?
- c) Explain two kinds of granularities with example.
- d) Explain master slave model in parallel computing.
- e) Differentiate Scatter and Gather operation.
- f) Suppose you have a parallel computer with n processors. What will be the speed up in this computer for a problem of adding n numbers with n processors?
- g) When a parallel system is said to be cost optimal?
- h) What is super-scalar Execution?
- i) What is VLIW?
- j) What is Cache Coherence?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- a) (i) Discuss various types of dependencies in super scalar processors. Give examples.  
(ii) Define latency. What is pre-fetching? How pre-fetching is used to minimize the latency?
- b) (i) What do you mean by shared address space platform? Explain UMA and NUMA architecture in detail.  
(ii) Discuss the cut-through routing. Calculate the total communication cost in cut through routing.
- c) (i) Draw an 8 X 8 Omega network. Let the node 6 want to send message to node 4, Then illustrate the path through which message is routed.  
(ii) What is Binary Reflected Gray Code? How a Ring with four nodes is mapped to a Hypercube?
- d) Out of the four PRAM models (EREW, CREW, ERCW, and CRCW), which model is the most powerful? Why? Explain the model.
- e) Write the algorithm that performs One-to- All broadcast operations with example.
- f) Explore a dichotomy which is based on the logical and physical organization of parallel computing platforms.
- g) Explain one mapping technique for Load Balancing with example.
- h) What do you mean by overheads in a parallel program? Explain different types overhead occurred in parallel program.
- i) Explain the Snoopy cache system.  
Explain the Cache coherence in multiprocessor system.
- j) A cycle in a graph is defined as a path originating and terminating at the same node. The length of a cycle is the number of edges in the cycle. Show that there are no odd length cycles in a d-dimensional hypercube.

- k) Derive the diameter, number of links, and bisection width of a k-ary d-cube with p nodes. Define  $l_{av}$  to be the average distance between any two nodes in the network. Derive  $l_{av}$  for a k-ary d-cube.
- l) Explain one algorithm for multiplying an  $n \times n$  matrix A with an  $n \times 1$  vector x to yield an  $n \times 1$  product vector y.

**Part-III**

**Only Long Answer Type Questions (Answer Any Two out of Four)**

- Q3** Define 'parallel computing'. What is its objective? Discuss and explain Bus-based, multi-stage and crossbar network topologies. **(16)**
- Q4** What are the metrics used for performance for Parallel Systems? Explain them. Explain various performance metrics and measures and the tradeoffs among these performance metrics in the context of cost-effectiveness. **(16)**
- Q5** a) What is meant by dependency? Explain different types of dependencies. Show remedy of each giving examples **(8)**  
b) Explain one mapping technique for Load Balancing with example. **(8)**
- Q6** **Differentiate between the following terms :** **(4 × 4)**  
a) multiprocessor and multi-computers  
b) tightly coupled and loosely coupled machines.  
c) temporal and data parallelism  
d) PVM and MPI