

MCA (Revised)
Term-End Examination
June, 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) Perform data dependency analysis on the following program : 6

S1 : $A = C + E$

S2 : $B = A \times 4$

S3 : $A = A + B$

S4 : $D = A / 7$

- (b) Specify a pipeline configuration to carry out the following task with a stream of numbers :

$$(A_i * B_i) + (C_i * D_i)$$

List the contents of all registers in the pipeline for $i = 1$ through 6. 6

- (c) Make a dataflow graph of the following expression : 4

$$F = (a + b) * (a - c) / (d - e)$$

- (d) What are the parameters used for analysing a combinational circuit ? Explain through an example. 6

- (e) How do you obtain Perfect Shuffle and Butterfly Permutations ? Illustrate through an example for each. 8

- (f) Discuss the following with respect to the recent trends in parallel computing : 10

- Hyper-threading
- Shared memory model
- Message passing model
- Grid computing

2. (a) Explain the concept of speed up by applying Amdahl's law. What is speed up if no part of the code can be parallelized ? What is speed up if 50% of the code can be parallelized ? 7

- (b) How will you define speed up if a number of processors is added to perform fraction of work in parallel ? 4
- (c) Explain the following in the context of message passing programming paradigm : 9
- How is the message communicated from one machine to another machine (process) in a distributed environment ?
 - Merits and demerits of message passing paradigm.
 - Describe some important features of data parallel programming model.
3. (a) Discuss the properties associated with interconnection networks with the help of examples. 10
- (b) Why do you require synchronization ? How is low level synchronization implemented ? 4
- (c) How is synchronization achieved through wait protocol and sole access protocol ? Discuss. 6

4. (a) Suppose you are given two sorted sequences A and B of length four as :

A = (5, 10, 15, 20)

B = (4, 8, 12, 16)

Draw the circuit of merging the two sequences as given above and explain the process.

10

- (b) State Sun and Ni's law for measuring speed up performance. 4
- (c) What are the factors causing the presence of overheads in parallel computers ? Elaborate. 6
5. Define the following concepts through examples : 20
- (a) Shared memory model
 - (b) Granularity
 - (c) Asymptotic notations
 - (d) MIMD model
 - (e) Associative memory
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