

## CZ4102 High Performance Computing

### Tutorial 1

To be discussed in week-4, Semester-1, AY06-07

**Please solve the tutorial questions in advance.**

1. Why is it highly recommended to optimize an algorithm before parallelization is performed on its sequential version?
2. In the following sample where image details will be extracted, the cell enclosing the left ear of the person in image must be computed sequentially, while the other 31 cells can be computed in parallel. What is the best speedup if high performance computing technique is used to process this image?

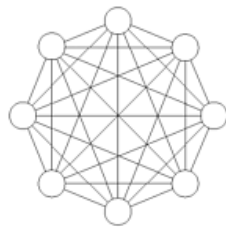


3. Given the declaration

```
int i [5] [2];
```

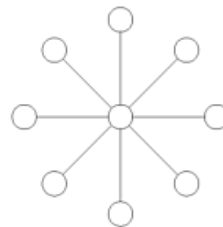
Write a C program to check for the order of the array elements which are stored in memory. Are the array elements stored in row-wise or column-wise order? Show the evidence.

4. Why is it difficult to construct a true shared-memory computer? What is the minimum number of switches for connecting  $p$  processors to a shared memory with  $b$  words where each word can be accessed independently?
5. Which type of the PRAM models (EREW, CREW, ERCW and CRCW) is the most powerful? Why?
6. Derive the bisection width of the following networks.



(a)

Completely Connected



(b)

Star

7. 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.