

**CS 493 Cluster Computing**  
**Sample Test 2-1**  
**50 minutes**

Three pages.

Attempt all questions in the spaces provided.  
Use additional paper if necessary.

**Name:** .....

Total Mark/30

**Part I**

Do not refer to any other materials.

Qu. 1 Define each of the following terms:

- |     |                                   |   |
|-----|-----------------------------------|---|
| (a) | Sequential consistency            | 2 |
| (b) | Mutex (mutual exclusion variable) | 2 |
| (c) | Condition variable                | 2 |
| (d) | Jacobi iteration                  | 2 |
| (e) | Chaotic relaxation                | 2 |
| (f) | False sharing                     | 2 |

Qu. 2 The following C-like parallel code is supposed to transpose a matrix (move the contents of rows to columns and vice versa):

```
forall (i = 0; i < n; i++)  
  forall (j = 0; j < n; j++)  
    a[i][j] = a[j][i];
```

Explain why the code will not work. Rewrite the code so that it will work.

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## Part II

Open Book - You may refer to any materials.

Qu. 2 Write a complete parallel program in MPI to implement Conway's Game of Life using a 16 x 16 board and 16 processes. Initialize the board to having some organisms and set the number of iterations to 100.

The following rules apply:

1. Every organism with two or three neighboring organisms survives for the next generation.
2. Every organism with four or more neighbors dies from overpopulation.
3. Every organism with one neighbor or none dies from isolation.
4. Each empty cell adjacent to exactly three occupied neighbors will give birth to an organism.