Roll No. | | | | | | | | |

(19)

B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2012

INFORMATION TECHNOLOGY

VII Semester

CS9043 MULTI-CORE PROGRAMMING

(Regulation 2008)

Time : 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Consider a program with two major modules. Module A takes up 75% of the execution time, and module B takes 20% of the execution time. If the degree of parallelism in module A is 4, and in module B is 2, estimate the speed-up that can be obtained by running it on a system with 4 cores.
2. How is zero-cycle context switch provided in hardware-supported multi-threaded processors ?
3. Identify four important activities in parallelizing an application.
4. Spin-locks are more suitable for multi-core systems than single-core systems. True or false. Justify your answer.
5. How is fine-grained locking useful ? Give an example for any data structure.
6. Why is barrier synchronization needed ?
7. Differentiate between the openMP single, master and critical pragmas.
8. Is it possible for an openMP program to deadlock ? Give an example or give reasons.
9. What are the different memory consistency models ?
10. What happens if the scatter function is not called in one of the processes in a group in MPI ?

PART-B (5 X 16 = 80 Marks)

11. (i) How would you emulate a message passing parallel processing model on a shared memory system, and vice-versa ? (6)

(ii) Give a two-line description of your programming assignment problems with openMP and MPI. Explain the parallelism that you identified in the algorithm, and the various options that you tried. Which optimizations worked, and which did not ? Why ? (6)

(iii) Shared memory programs are difficult to debug than message passing ones. True / False. Justify the answer from your experience. (4)

14. (a) (i) Write a parallel program using openMP to transpose an nxn matrix. Estimate the speed-up expected with k processors. (8)

(ii) Explain the ABA problem that can occur in non-blocking algorithms and its solution. (4)

(iii) Consider a for loop in openMP with 1000 iterations running on 4 threads. Calculate the partition sizes if (A) the guided clause is used, and chunk size is 80; (B) dynamic clause is used. (4)

OR

(b) (i) Write a **cache-friendly** parallel code using openMP for matrix multiplication. Provide comments to explain your code. (8)

(ii) Consider the loop

```
a[0] = 0;
for( i=1; i <n; i++)
        a[i] = a[i-1] + i;
```

There is clearly a loop-carried dependence. Is it possible to eliminate the dependence and parallelize the loop ? Explain. (4)

(iii) What is the effect of the different clauses used to copy data in and out in OpenMP ? (4)

15. (a) (i) Write parallel code for merge-sort algorithm using MPI. (8)

(ii) What would happen if the functions MPI_INIT and MPI_Finalize are not included ? (4)

(iii) How can all-gather be implemented in an efficient manner ? (4)

OR

(b) (i) Write parallel code using MPI to perform a word search in a huge dictionary. Explain how you are partitioning the problem, and estimate the speed-up expected. (8)

(ii) Explain the different point-to-point communication functions in MPI. (4)

(iii) When a reduction operation is performed, what is the initial value to which the reduction variable will be set for (A) a multiply operation and (B) a MIN operation . (4)

***** GOOD LUCK *****