

B.E./B.TECH. Degree Examination, September 2020

Semester - VIII

CS16801 – MULTICORE ARCHITECTURES AND PROGRAMMING

(Regulation 2016)

Time: Three hours

Maximum : 80 Marks

Answer ALL questions

PART A - (8 X 2 = 16 marks)

1. If there are p processor the number of links in ring interconnect is
 - A. p
 - B. 2p
 - C. 3p
 - D. 4p
2. If multiple threads are updating the same shared data in an unsafe way, then the situation is called as
 - A.Data Manipulation
 - B.Data Security
 - C.Data Races
 - D.Data Hiding
3. #pragma omp parallel for private(i)
 for (int i = 0; i < 100; i++)
 { a[i] = i; }
 Consider the no of threads =4. How many blocks of iterations are executed by each thread for the above program?
 - A. 25
 - B. 50
 - C. 100
 - D. 75
4. If the command
 MPI_Reduce(b, c, 4, MPI_INT, MPI_SUM, 2, MPI_COMM_WORLD) is executed,
 how many results will be produced?
 - A. 1
 - B. 2
 - C. 4
 - D. 8
5. In a multiprocessor where number of processor is 2, If 90% of program is parallelizable, the run time of serial program T_{serial} is 10 seconds, What is the overall parallel run time T_{parallel} ?
6. Mention the advantages and disadvantages of spin-lock.
7. Discuss briefly about shared and private scope of a variable in OpenMP.
8. State the differences between MPI_Bcast and MPI_Scatter.

PART B - (4 X16 = 64 marks)

09. (a) In Flynn's taxonomy of classification of computers, Identify which architecture is suitable to implement parallelism and justify your answer. **(16)**
 (OR)
 (b) Develop a parallel algorithm for the given set of n values $a_0, a_1, a_2, \dots, a_{n-1}$ to find the sum of $a_0 + a_1 + a_2 + \dots + a_{n-1}$. Identify the tasks involved in it. **(16)**
10. (a) Develop a suitable algorithm for Producer Consumer problem using semaphore and mutex lock. **(16)**
 (OR)
 (b) Identify and discuss a various suitable mechanism to signal a process /thread in the waiting state that the work is ready for them. **(16)**
11. (a) Given n integers perform sorting using **(16)**
 (i)Bubble sort ,
 (ii)Odd-even transposition sort

Which algorithm provides more opportunities for parallelism. If parallelism is not possible justify why it is not possible. If parallelism is possible implement the sorting algorithm in OpenMP Program.

(OR)

- (b) Identify each subtasks involved to perform matrix-vector multiplication and write the code in OpenMP. **(16)**
12. (a) Illustrate the following concept in distributed memory system where X is a vector with $n=14$ components and $\text{comm_sz}=4$, How would the components of X be distributed among the processes in a program that used a block distribution, cyclic distribution and block-cyclic distribution with blocksize $b=2$ and demonstrate with the suitable code. **(16)**
- (OR)**
- (b) Given a set of five unsigned integers with the decimal values 13,22,43,64 and 99, write an MPI program to determine the decimal result of the following reduction operations: add, multiply, maximum, minimum, bitwise or, bitwise and, logical or, logical and. **(16)**