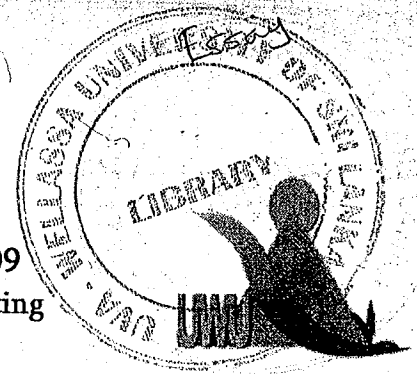


Uva Wellassa University, Sri Lanka
End Semester Examination – June 2009
CST309-2 Distributed and Parallel Computing



Time: Two (02) hours

09-380 - CST 309-2

Total 05 Questions

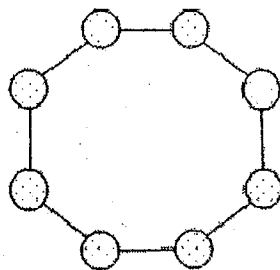
Answer all five (05) questions

Please return the question paper with the answer script

Q1.

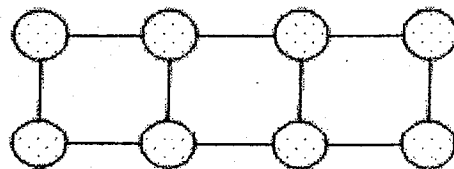
- I. The job is to estimate how long it takes to count n numbers with p people. One person calculates n numbers in $(n-1)t_c$. Let us presume, that there are eight persons and the numbers are easily divided among them. Transferring the results takes t_w . How long a time it takes for p people if:

- I. They are sitting in a circle



(5 marks)

- II. They are sitting in 2 by 4 rows.



(5 marks)

- II. One person uses $(n-1)t_c$ to count n numbers. Is it possible that p persons solves the problem in less time than $(n-1)t_c/p$? Justify your answer. (5 marks)

- III. What if the eight people from assignment number 1 calculate partial sums on the blackboard so that everyone can see the others results as soon as they are ready. How long a time it takes now and how about assignment number 2? Think of this as a situation where anybody can communicate with anybody.

(5 marks)

Q2.

- I. Compare the following parallel architectures. Describe two unique features of each of them that cannot be found in any of the other architectures.

- I. Parallel vector processor (PVP)
- II. Symmetric multiprocessor (SMP)
- III. Massively parallel processor (MPP)
- IV. Cluster of workstations (COW)
- V. Distributed shared machine (DSM)

(10 marks)

- II. Five different real-life parallel architectures and applications models are here. Explain how they differ, and what are their strengths and weaknesses. The models are:

- a. PRAM
- b. EREW-PRAM
- c. CREW-PRAM
- d. CRCW-PRAM
- e. VLSI

(10 marks)

Q3.

- I. Explain in detail about followings.

- a. 5 types of data dependence
- b. What is hardware parallelism?
- c. Program partitioning
- d. Physical computational models
- e. Degree of parallelism

(10 marks)

- II. Describe following architectures with a flow diagram.

- a. Embedding $p=32$ hypercube in to 2-D mesh
- b. Typical SIMD architecture and MIMD architecture
- c. Typical Uniform memory access shared address space computer memory architecture
- d. Bus based inter connection with no local cache
- e. Parallel Processor Layout of Shared Memory and the Distributed Memory

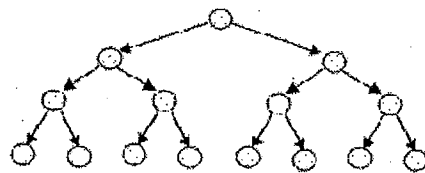
(10 marks)

Q4.

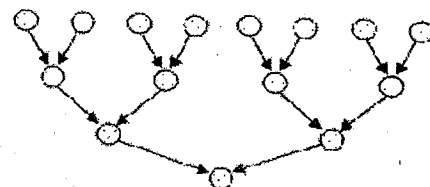
- I. What is parallel computing in the simplest sense? (2 marks)
- II. What are uses for Parallel Computing? (2 marks)
- III. Prove the Gustafson's law and the Amdahl's law (10 marks)
- IV. Explain the difference of Harmonic Mean Speedup and Amdahl Law by using its functions (3 marks)
- V. What component must have the general multiprocessor system? (3 marks)

Q5. For the task graphs shown in the picture, find out the following

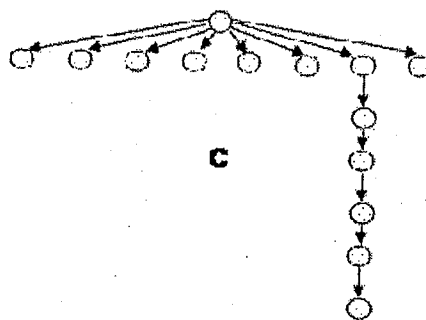
- I. Maximum degree of concurrency
- II. Critical path length
- III. Maximum achievable speedup over one process assuming that an arbitrarily large number of processes is available
- IV. The minimum number of processes needed to obtain maximum speedup
- V. The maximum speed up, if the number of processes is limited to (a) 2, (b) 4, (c) 8.



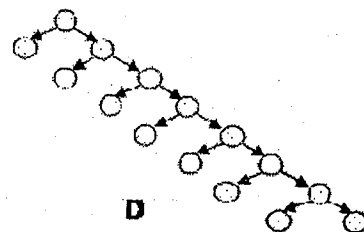
A



B



C



D

(20 marks)