Roll No......................................

MCSE-103

M.E./M.Tech. I Semester Examination, June 2020
Advanced Computer Architecture
Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

1. a) A 400-1'''1Hz processor was used to execute a benchmark program with the following instruction mix and clock cycle counts: Instruction type instruction count Clock cycle count.   7

Instruction type	Instruction count	Clock cycle count
Integer arithmetic	450000	1
Data transfer	320000	2
Floating point	150000	2
Control transfer	80000	2

Determine the effective CPI, MIPS rate and execution time for this program.

b) What are vector supercomputers? Discuss some vector processor models.   7

2. Consider the following pipeline reservation table.   14

X				X
	X			X
			X	

i) What are the forbidden latencies and the initial collision vector?

ii) Draw the state transition diagram for scheduling the pipeline.

iii) List all simple and greedy cycles.

iv) Determine the optimal constant latency cycle and minimal average latency.

v) Let the pipeline clock period be T = 10ns. Determine the throughput of this pipeline.

3. a) Characterize the architectural operations of SIMD computers.   7

b) Explain the differences among UMA, NUMA, COMA and NORMA computers.   7

4. a) What is data dependence and control dependence? Write the programs which shows these dependency among data.   7

b) What are data and control hazards? Describe various methods to resolve these hazards.   7

5. a) Differentiate between synchronized and asynchronized parallel algorithms.   7

b) Write a parallel algorithm to implement the concurrent quick sort algorithm.   7

6. Explain the following terms related to shared-variable programming on multiprocessors. 14
   i) Multiprogramming
   ii) Multiprogramming in MIMD mode
   iii) Multiprogramming in MPMD mode
   iv) Multitasking
   v) Multithreading
   vi) Program partitioning

7. a) Discuss the scheduling and load balancing problem for a multi-processor system. Give a suitable example with illustrative diagrams. 7
   b) Answer the following questions on design choices of multicomputer made in the past. 7
      i) Why were low-cost processors chosen over expensive processors as processing nodes?
      ii) Why was distributed memory chosen over shared memory?
      iii) Why was message passing chosen over address switching?
      iv) Why was MIMD, MPMD or SPMD control chosen over SIMD data parallelism?

8. Write short notes on following. 14
   i) Bernstein's condition
   ii) Degree of parallelism
   iii) Amdahl's law for a fixed Workload
   iv) Tomasulo's algorithm
   v) Remote procedure call

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