Total No. of printed pages = 3

19/5th Sem/PCSE315

2021

HIGH PERFORMANCE COMPUTING

Full Marks – 100

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. Consider a five stage (s1, s2, s3, s4, s5) pipeline processor P.

   (a) If each stage need 2ns and total 1000 instructions needs to be executed then compute the speed up of processor P with a sequential processor.

   (b) Compute the speed up of processor P if {s1 = 1ns, s2 = 2ns, s3 = 3ns, s4 = 4ns and s5 = 5ns} when 1000 instructions needs to be executed.

   (c) Compute the utilization of processor P for both the cases as mentioned in Q1. (a) and Q1. (b).

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(d) Do you think increasing number of stages in pipelining will improve the speed up – justify.

4+5+6+5=20

2. (a) Why the concept of multicore processor is introduced ?

(b) With a diagram briefly discuss about superscalar processor.

(c) What is the difference between superscalar and vector processor.

(d) With an example discuss Amdhal's law.

4+7+5+4=20

3. (a) Consider a computer system having a cache of 1024 KB. One block contain 16 words and size of a block is 8 bytes. It also has a RAM of 1 MB (1 block = 16 words and 1 word = 8 bytes). Compute the different parts of the address fields for the following cache mapping :

(i) direct

(ii) associative and

(iii) 4 way set associative.

(b) What challenges you will face if the associativity is increased ? Discuss with an example.

12+8=20

4. (a) With suitable examples discuss the different data hazards.

   (b) Is it possible to overcome control hazards ?

   (c) With suitable diagram discuss Flynn's classification. 6+4+10=20

5. (a) With suitable diagram discuss UMA and NUMA.

   (b) Consider a process needs to be executed remotely. Clearly identify the different stages. What challenges the process may face ? 8+6+6=20

6. (a) How process synchronization can be done using semaphore ? Discuss with an example.

   (b) Write an MPI program to add all the elements of an array of size 10. 10+10=20