Printed Pages : 4   MCA – 206

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 1471   Roll No. [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

M.C.A.

(SEM. II) EXAMINATION, 2006-07
COMPUTER ARCHITECTURE AND MICROPROCESSOR
(SPECIAL EXAMINATION)

Time : 3 Hours]   *[Total Marks : 100*

Notes :   (i)   *Attempt **all** questions.*

(ii)   *All questions carry **equal** marks.*

(iii)   *Assume suitable missing data and specify it clearly.*

1   Attempt any **two** parts of the following :   10×2=20

(a)   Draw the pipeline organization for fixed-point multiplication of two 8-bit integers using carry save adders, carry propagate adders and patches of appropriate data width.

(b)   (i)   What are the major characteristics of a pipeline system ? Explain the overheads associated with pipelining in a processor.

(ii)   Differentiate between hardware and software parallelism.

(c)   Define parallel computing. How can you achieve parallelism in a uniprocessor system ? Classify the parallel computer architectures.

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2   Attempt any **two** parts of the following :   **10×2=20**

   (a)   Consider the following reservation table for a four-stage pipeline with a clock cycle $\tau = 20$ ns.

	1	2	3	4	5	6
S_1	X					X
S_2		X		X		
S_3			X			
S_4				X	X	

   (i)   Draw the state transition diagram for scheduling the pipeline.

   (ii)   Determine the MAL associated with the shortest greedy cycle.

   (iii)   Determine the pipeline throughput corresponding to the MAL and given τ.

   (iv)   Determine the lower bound on the MAL for this pipeline. Have you obtained the optimal latency from the above state diagram ?

   (b)   (i)   Explain the different types of vector instructions for register-based pipelined vector machines.

   (ii)   Write down the advantages and disadvantages of SIMD array processors.

   (c)   Explain the following in brief : (any **four**)

   (i)   Effect of branching on pipeline throughput.

   (ii)   Internal data forwarding

   (iii)   Lower bound and upper bounds of minimal average latency.

   (iv)   Difference between dependency and hazard

   (v)   Instruction level parallelism

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3 Attempt any **two** parts of the following : **10×2=20**

(a) (i) Show the difference between perfect shuffle and inverse perfect shuffle data routing function.

(ii) Explain the SIMD matrix multiplication.

(b) Differentiate between blocking, non-blocking and re-arrangeable networks. Draw the interconnection network for 8 × 8 omega network.

(c) (i) Draw a 16-node barrel shifter static connection network. What is its node degree and diameter ? Explain its data routing function.

(ii) Describe the UMA, NUMA and COMA based multiprocessor systems.

4 Attempt any **two** parts of the following : **10×2=20**

(a) In the following block of computations a, b and c are three external inputs and z is the final output :

$$z \in \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

(i) Draw a data flow graph using *, +, −, / and ^ (for square root) as arithmetic operators.

(ii) Indicate the events that can be done in parallel.

(b) (i) Describe the function of 8086 instruction queue. How does it speed up processing ?

(ii) Explain the role of Segment Registers, Base Registers, Index Register and Pointer Registers in 8086 microprocessor.

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(iii) Detail the functionality of instruction pointer in 8086.

(c) (i) Explain various scheduling models for multiprocessor system.

(ii) Classify and explain the dataflow computer organizations.

(iii) List the various multiprocessor scheduling strategies. Write advantage and disadvantage of each.

5 Attempt any **four** parts of the following : **5×4=20**

(a) Write down a program in 8085 assembly language to unpack a 8-bit BCD number available at 2000 H memory location. Store the unpacked numbers at 2001 H and 2002 H memory locations.

(b) Write an 8085 assembly language program to generate a rawtooth waveform at the output port 80 H.

(c) Explain the functions of ALE and IO/$\overline{\text{M}}$ signals of the 8085 microprocessor.

(d) Explain various addressing modes available in 8085 assembly language.

(e) Explain the role of stack in making calls to subroutine in 8085. Also give difference between a subroutine and an interrupt service routine.

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