



Name :

Roll No. :

Invigilator's Signature :

CS/M.Tech (CSE)/SEM-2/MCSE-201/2012

2012

ADVANCED COMPUTER ARCHITECTURE

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

1. Answer any *seven* of the following : 7 × 2 = 14
- i) Briefly state Flynn's classification.
 - ii) What are the conditions under which WAR and RAW hazards can occur ?
 - iii) How fault tolerance is achieved in interleaved memory organization ?
 - iv) What is the bottleneck of von-Neumann architecture ?
How is it resolved ?
 - v) Find out the speed-up factor of pipelined architecture over non-pipelined architecture.
 - vi) Write down the routing functions for mesh connected Illiac network.



- vii) Briefly differentiate between superscalar and super-pipelined architecture.
- viii) Compare the switching complexity of bus system, multistage network and crossbar switch.
- ix) State the bounds on MAL.
- x) Unifunction pipeline must be static whereas dynamic pipeline must be multifunction. Justify your answer.

GROUP – B

Answer any *four* of the following. $4 \times 14 = 56$

2. Consider the 3-stage pipelined processor specified by the following reservation table :

		Time →				
Stages ↓		1	2	3	4	5
	S1	X				X
	S2		X		X	
	S3			X	X	

- a) List the set of forbidden and permissible latencies and the collision vector.
- b) Draw a state transition diagram showing all possible initial sequences (cycles) without causing a collision in the pipeline.



- c) List all the simple cycles & greedy cycles from the state diagram.
- d) What is MAL of the pipeline ?
- e) How to obtain an optimal MAL ? $1 + 1 + 3 + 2 + 7$
3. a) Draw the configuration models of SIMD system.
- b) Describe the characteristics of multistage interconnection network.
- c) Write down the routing function for a hypercube network. $6 + 6 + 2$
4. a) Draw the Clos network for $N = 8$ and derive Benes network from that.
- b) Draw the multistage omega network for $N = 8$. $(5 + 4) + 5$
5. a) Describe Low-order interleaving using suitable block diagram.
- b) Explain three different mechanisms to remove pipeline hazards.
- c) Explain RAW, WAW, WAR. $5 + 6 + 3$
6. a) Explain the execution of the vector instruction in a SIMD computer with 8 PEs :
- $$A = (A_0, A_1, \dots, A_n - 1)$$
- $$S(k) = \sum_{i=0}^k A_i \text{ for } k = 0, 1, \dots, n - 1$$
- b) Describe the multistage hypercube network for $N = 8$. $9 + 5$

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7. a) Describe the internal organization of a processing element (PE) in SIMD system.
- b) Write down the need of routing and masking functions in SIMD system.
- c) Write down the characteristics of a switch box in multistage interconnection network.
- d) How branching can be handled in pipeline ?
(5 + 3 + 3 + 3)
8. Discuss about any *two* of the following topics : 2 × 7
- a) $4^2 \times 3^2$ delta network
- b) Parallel processing
- c) RISC & overlapped register window
- d) Arithmetic pipeline.
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