



Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech/ECE(N)/SEM-5/EC-504A/2012-13

2012

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

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :
10 × 1 = 10

- i) The programs which are as permanent as hardware
and stored in ROM is known as

- | | |
|-------------|--------------|
| a) Hardware | b) Software |
| c) Firmware | d) ROM ware. |

- ii) Primary memory stores

- | | |
|------------------|------------------|
| a) Data alone | b) Program alone |
| c) Results alone | d) all of these. |



- iii) The idea of cache memory is based on
- a) the heuristic 90-10 rule
 - b) the property of locality of reference
 - c) the fact that only a small portion of a program is referenced relatively frequently
 - d) all of these.
- iv) The capacity of a memory unit is defined by the no. of words multiplied by the no. of bits/word. How many separate address and data lines are needed for a memory of $4K \times 16$?
- a) 10 address, 16 data lines
 - b) 11 address, 8 data lines
 - c) 12 address, 12 data lines
 - d) 12 address, 16 data lines.
- v) Which of the following techniques is hardware based, is used in high performance computer systems to provide certain types of parallelism in instruction processing ?
- a) Pipelining
 - b) Networking
 - c) Multiprocessing
 - d) Multitasking.



- vi) The "Instruction Register" in a CPU, holds the instruction which
- a) was executed previously
 - b) is being executed currently
 - c) to be executed next
 - d) contain no instruction information at all.
- vii) How many memory locations can be accessed with a 6-bit address bus ?
- a) 32
 - b) 128
 - c) 64
 - d) 16.
- viii) The basic principle of the Von-Neumann computers
- a) storing program and data in separate memory
 - b) using pipeline concept
 - c) storing both program and data in the same memory
 - d) using a large no. of registers.
- ix) In a microprocessor the address of the next instruction to be executed is stored in
- a) stack pointer
 - b) address latch
 - c) program counter
 - d) generated purpose register.



- x) Cache memory
 - a) increase performance
 - b) reduces performance
 - c) machine cycle increases
 - d) none of these.
- xi) Instruction cycle is
 - a) Fetch-decode-execution
 - b) Decode-fetch-execution
 - c) Fetch-execution-decode
 - d) none of these.
- xii) Associative memory is a
 - a) very cheap memory
 - b) pointer addressable memory
 - c) content addressable memory
 - d) slow memory.
- xiii) The performance of a pipelined processor suffers if
 - a) the pipeline stages have different delays
 - b) consecutive instructions are dependent on each other
 - c) the pipeline stages share hardware resources
 - d) all of these.



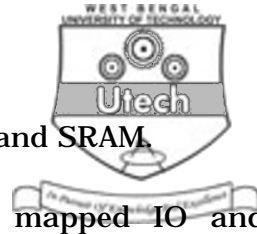
- xiv) Control unit operation is performed by
- Hardware control only
 - Micro-program control only
 - Hardware or micro-program control
 - none of these.
- xv) A 'hit' occurs
- when word is found in virtual memory
 - when word is found in cache memory
 - when word is not found in virtual memory
 - when word is not found in cache memory.
- xvi) Which one of the following is the advantages of virtual memory ?
- Faster access to memory on an average
 - Process can be given protected address space
 - program larger than the physical memory size can be run
 - none of these.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. a) Write key features of von Neumann architecture of a computer and mention the bottlenecks.
- b) How does Harvard architecture differ from von Neumann architecture ? $2 + 1 + 2$



3. With diagram, distinguish between DRAM and SRAM.
4. Write three points to differentiate I/O mapped IO and Memory Mapped IO.
5. Write a VHDL programme of 4 bit adder using structural modeling style.
6. Discuss about the different hazards in pipelining.
7. What is virtual memory ? Why is it called virtual ? Write the advantage of virtual memory. 2 + 1 + 2

GROUP - C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. a) What is Cache memory ? Why is it needed ? Explain the write-through and write-back mechanism. Why is set-associative mapping and technique more advantageous than direct or associative mapping technique ? A computer has 512 kB cache memory and 2 MB main memory. If the block size is 64 bytes, then find out the subfields for
 - i) direct mapped cache
 - ii) associative
 - iii) 8-way set associative cache.
- b) Why memory hierarchy is needed ? 11 + 4



9. a) Describe the function of major components of a digital computer with neat sketch.
- b) Explain the role of an operating system in a computer system.
- c) Explain the relative advantages and disadvantages of parallel adder over serial adder.
- d) What is the difference between carry look ahead adder and carry ripple adder ?
10. What do you mean by HDL ? How many hardware models are present in VHDL ? Briefly discuss with proper example of various hardware modeling in VHDL. What do you mean by Top down design and Bottom up design style ?

7 + 4 + 2 + 2

11. Write short notes on any *three* of the following :
- a) Flynn's classification
- b) DMA processing
- c) Bus organization using tri-state buffer
- d) Magnetic recording
- e) Serial adder
- f) Harvard architecture.

1 + 1 + 8 + 5