

2012

COMPUTER ORGANIZATION

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 from the following :

$$10 \times 1 = 10$$

- i) Maximum number of directly addressable locations in the memory of a processor having 10 bits wide control bus, 20 bits address bus and 8 bit data bus is

- | | |
|--------|-------------------|
| a) 1 K | b) 2 K |
| c) 1 M | d) None of these. |

- ii) With 2's complement representation, the range of values that can be represented on the data bus of an 8 bit microprocessor is given by

- | | |
|-------------------|----------------|
| a) - 128 to + 127 | b) - 128 + 128 |
| c) - 127 to + 128 | d) 0 - 255. |

[Turn over

- iii) Which of the following addressing modes is used in instruction RAL
- a) Immediate
 - b) Implied
 - c) Direct
 - d) Register.
- iv) The principle of locality justifies the use of
- a) Interrupts
 - b) polling
 - c) DMA
 - d) Cache memory.
- v) Periodic refreshing is needed
- a) SRAM
 - b) DRAM
 - c) ROM
 - d) EPROM.
- vi) Subtractor can be implemented using
- a) adder
 - b) complement
 - c) both (a) and (b)
 - d) none of these.
- vii) Physical memory broken down into groups of equal size is called
- a) page
 - b) tag
 - c) block / frame
 - d) index.
- viii) Bi-directional buses use
- a) Tri-state buffers
 - b) Two tri-state buffers in cascade
 - c) Two back to back connected tri-state buffer in parallel
 - d) two back to back connected buffers.
- ix) Micro Instruction are kept in
- a) Main memory
 - b) Control memory
 - c) Cache memory
 - d) None of these.
- x) Instruction cycle is
- a) fetch-decode-execution
 - b) decode-fetch-execute
 - c) fetch-execution-decode
 - d) none of these.

GROUP - B

(Short Answer Type Questions)

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

2. a) Explain the difference among three-address, two address, one address and zero address instruction for the equation $X = (A + B) * C$.

- b) Explain Base-Index Addressing with proper example.

$$(4 + 1) = 5$$

3. A disk drive has 20 sectors/track, 4000 bytes/sector, 8 surfaces all together. Outer diameter of the disk is 12 cm and inner diameter is 4 cm. Inner-track space is 0.1 mm. What is the no. of tracks, storage capacity of the disk drive and data transfer rate there from each surface ? The disk rotates at 3600 rpm.

4. What is a Von Neumann architecture ? What is Von Neumann bottleneck ? $(3 + 2) = 5$

5. What do you mean by Stack memory.

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

6. a) Draw a diagram for digital computer.
b) What is bus ? Draw and describe the bus architecture for a digital computer.

- c) What are difference between Serial and Parallel transmission ? $4 + 7 + 4$

7. a) Explain Booth's algorithm for multiplication of signed 2's complement number in flow chart.

- b) Apply Booth's algorithm to multiply the two numbers $(6)_{10}$ and $(-9)_{10}$. Assume the multiplicand and multiplier to be 5 bits each.

c) Explain the relative advantages & disadvantages of parallel adder over serial adder.

d) What is virtual memory ? $5 + 4 + 4 + 2$

8. a) What is Cache memory ? Why is it needed ?

b) Explain the Write-through and Write-back mechanism ?

c) Given the following, determine the size of the sub fields (in bits) in the address for Direct Mapping, associative and Set associative mapping cache schemes :

We have 256 MB main memory and 1 MB cache memory.

The address space of this processor is 256 MB.

The block size is 128 bytes.

There are 8 blocks in a cache set.

d) A three-level memory system having cache access time of 5 nsec and disk access time of 40 nsec, has a cache hit ratio of 0.96 and main memory hit ratio of 0.9. What should be the main memory access time to achieve an overall access time of 16 nsec ? $(2 + 1) + 2 + 5 + 5$

9. a) What are the different types of DMA controllers and how do they differ in their functioning ?

b) What is instruction cycle ? Draw time diagram for memory read operation.

c) How does work polling ? $(7 + (1 + 4) + 3)$

10. Write short notes on any three of the following : $3 \times 5 = 15$

i) Addressing modes

ii) Bus organization using tristate buffer

iii) Paging

iv) Microinstruction.