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Institute of Science and Technology
2066
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Bachelor Level/ First Year/ Third Semester/ Science   Full Marks: 80
Computer Science and Information Technology (CSc. 201)   Pass Marks: 32
(Computer Architecture)   Time: 3 hours

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Long Questions:
Attempt any two questions: (2x10=20)

1. Explain the different types of addressing modes and compare each other.

2. What are the major differences between I/O bus and interface modules? What are the advantage and disadvantage of each?

3. What are the three possible modes to transfer the data to and from peripherals? Explain.

Short Questions:
Attempt any ten questions: (10x6=60)

4. Differentiate between parity checker and parity generator.

5. What do you mean by shift micro-operations? Explain.

6. Explain the computer instruction with example.

7. Mention the type of interrupt and explain it.

8. What do you mean by field decoding? Explain.

9. Write down the following equation in three address, two address and one address instruction.

$$Y = AB + (C \times D) + E(F / G)$$

10. Explain the characteristics of RISC and CISC.

11. Explain the booth algorithm with example.

12. What is the main function of DMA? Mention the three points DMA configurations.

13. What are the different types of I/O commands? Explain.

14. Differentiate between associative page table and replacement.

15. Write short notes on the following:

    a) Memory space

    b) Address space

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Long Questions:
Attempt any two questions: (2x10=20)

1. Explain the Micro program sequence with example.

2. Explain with example of Data manipulation instructions.

3. Explain the non-restoring Division algorithm, flow chart hardware implementation with example.

Short Questions:
Attempt any ten questions: (10x6=60)

4. What do you mean by instruction format? Explain..

5. Differentiate between Hardwired and Micro program control unit.

6. What do you mean by logic micro-operations?

7. Differentiate between direct and indirect addressing modes.

8. Explain with example of Data transfer instructions.

9. What are the major differences between RISC and CISC architecture?

10. Explain the subtraction algorithm with signed 2's compliment.

11. Differentiate between isolated I/O and Memory Mapped I/O.

12. What is DMA transfer? Explain

13. What is the role of input-output processor (IOP) in computer system? Explain.

14. What is memory management hardware? Explain.

15. Write short notes on the following:

    a) Sequential memory hierarchy

    b) Random memory hierarchy

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Long Questions:
Attempt any two questions: (2x10=20)

1. Explain the restoring division algorithm with example.

2. What do you mean by I/O interface? Explain the I/O bus and Interface module.

3. What do you mean by memory organization? Explain the memory management hardware with example.

Short Questions:
Attempt any ten questions: (10x6=60)

4. Explain the error detection code with example.

5. Differentiate between logic microoperations and shift microoperations.

6. Explain the I/O instruction with example.

7. What do you mean by memory mapping? Explain.

8. What do you mean by control memory? Explain the microinstructions and microoperation format.

9. What do you mean by addressing modes? Differentiate between indexed addressing modes and base register addressing mode.

10. Explain the Booth algorithm. Multiply 3 x 5 using booth algorithm.

11. Differentiate between isolate and memory mapped I/O.

12. Explain the I/O processor with block diagram.

13. Explain data transfer instruction with example.

14. Differentiate between RISC and CISC processor.

15. Write short notes on the following:

    a) Interrupt cycle

    b) DMA

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Long Questions:
Attempt any two questions: (2x10=20)

1. Explain the non-restoring division algorithm with example.

2. What do you mean by memory system? Explain the characteristics of Memory systems of computer.

3. Explain the Data transfer and manipulation instruction with example.

Short Questions:
Attempt any ten questions: (10x6=60)

4. Differentiate between fixed point representation and floating point representation.

5. Explain the arithmetic logic shift unit.

6. What do you mean by computer register and computer instructions? Explain.

7. Differentiate between Hardwired control and Microprogram control unit.

8. Explain the types of instruction format and compare each of them.

9. What do you mean by DMA controller? What are the three registers used in DMA controller? Explain.

10. What is virtual memory? What are the major differences between Address space and Memory space?

11. What do you mean by stack organization? What are the major differences between register stack and memory stack?

12. Explain the logical and bit manipulation instruction with example.

13. What are the characteristics of CISC and RISC processors? Explain.

14. What do you mean by interface? What are the major differences between I/O bus and Memory bus?

15. Write short notes on the following:

    a) Parity Generator
    b) Array Multiplexer

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Long Questions:
Attempt any two questions: (2x10=20)

1. What is Input-output processor (IOP)? Why IOP is needed in Computer System? Explain.

2. Explain the DMA controller with block diagram. How the DMA interact with I/O device? Explain.

3. What in the general model of Microprogram Control Unit? Explain the major steps when you designing of microprogram control unit.

Short Questions:
Attempt any ten questions: (10x6=60)

4. What is an error detection code? Explain with example.

5. Design the binary adder-subtractor with example.

6. Write down the code to evaluate

   $Y = A (B/C - D) + E$ for one, two and three instruction format.

7. Mention the different types of data transfer instructions and explain with example.

8. What are the different types of I/O techniques? Explain.

9. What are the typical characteristics of RISC instruction set architecture? Explain.

10. Show the steps of multiplication process using Booth algorithm of the following binary numbers:

    $Y = 8 \times 10$.

11. What are the difference between I/O bus and interface modules? Explain.

12. Differentiate between Input-output processor (IOP) and Direct Memory Access (DMA).

13. What are the key characteristics of computer memory system? Explain.

14. What is the main role of memory management hardware? Explain.

15. Write short notes on the following:

    a) Memory Protection

    b) Address Mapping

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Long Questions:
Attempt any two questions: (2x10=20)

1. Write down the code to evaluate $Y = A/B + CD + E (F/G)$ in three address, two address, one address and zero address instruction format.

2. Explain the mapping function. Why replacement algorithm is used in set associative mapping? Explain with example.

3. Differentiate between interrupt driven I/O with programmed I/O. Explain with example how data transfer is performed in direct memory access (DMA).

Short Questions:
Attempt any ten questions: (10x6=60)

4. Explain the floating point addition and subtraction with flowchart.

5. Comparison between RISC and CISC.

6. What are the key characteristics of computer memory system? Explain.

7. Explain input/output interface with example.

8. Compare the different types of addressing modes with example.

9. Explain the microprogram control unit with example.

10. Explain the non-restoring division algorithm with example.

11. Explain the input-output processor with block diagram.

12. Explain the data manipulation instruction with example.

13. Explain with example of Arithmetic microoperations.

14. Explain memory management hardware with example.

15. Write short notes on the following:

    a) Virtual memory

    b) Register organization.

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(Computer Architecture)

Full Marks: 80
Pass Marks: 32
Time: 3 hours

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Long questions:

Attempt any two questions: (2x10=20)

1. Explain address mapping using pages. A virtual memory system has an address space of 8k words, a memory space of 4K words, and page and block sizes of 1K words. The following page reference changes occur during a given time interval. (Only page changes are listed. If the same page is referenced again, it is not listed twice).

    4 2 0 1 2 6 1 4 0 1 0 2 3 5 7

   Determine the four pages that are resident in main memory after each pager reference change if the replacement algorithm used is   (a) FIFO;   (b) LRU.

2. Why do computers need input-output interface? Explain the sequence of operations carried out during CPU-IOP communication with the help of suitable flowchart.

3. What is a microprogram sequencer? With block diagram, explain the working of microprogram sequencer.

Short Questions:
Attempt any ten questions: (10x6=60)

4. Differentiate between address space and memory space. An address space is specified 24 bits and the corresponding memory space by 16 bits. If a page consists of 2K words, how many pages and blocks are there in the system?

5. What do you mean by interrupt? Draw and explain the flowchart for interrupt cycle.

6. Explain with an example, how effective address is calculated in different types of addressing modes.

7. What the differences is between isolated and memory mapped I/O? What are the different types of I/O commands?

8. Show the memory organization (1024 bytes) of a computer with four 128x8 RAM Chips and 512x8 ROM Chip. How many address lines are required to access memory?

9. Show the step-by-step multiplication process using Booth's algorithm, when +14 is multiplied by -14 Assume 5-bit registers that hold signed numbers. .

10. Briefly explain fixed-point representation of numbers. What is the signed magnitude, 1's complement and 2's complement of -9?

11. Explain about the basic computer instruction format. When instruction set is said to be complete.

12. Explain Overlapped Register Windows with suitable example.

13. Explain the process of overflow detection with both signed and unsigned numbers.

14. Define selective-set, selective-component, selective-clear, mask, insert and clear operation with an example.

15. Write short notes on the following.
    (a) Integer representation
    (b) Subroutines

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