



Dezyne École College

Bachelor of Computer Application (B.C.A.) First Year-1st Semester

Computer Architecture

Part-A: 20 Short Answer Questions (2 Marks Each)

(Answer in ~50 words each)

1. Convert the hexadecimal number $4F_{16}$ to binary and decimal.
2. What is the 2's complement of the binary number 110101?
3. Define cache memory.
4. What is the difference between SR and JK flip-flops?
5. List any two basic theorems of Boolean algebra.
6. What is the purpose of a register in a computer system?
7. What is a full adder? Write its Boolean expression.
8. Define a decoder with an example.
9. What is a multiplexer?
10. Write the Boolean expression for a NOR gate.
11. Define opcode and operand.
12. What are don't care conditions in K-maps?
13. What is virtual memory?
14. Mention any two addressing modes.
15. What is DMA?
16. What are synchronous and asynchronous buses?
17. State two advantages of static RAM over dynamic RAM.
18. Define a weighted code with one example.
19. What is the function of a control unit in CPU?
20. Write any two differences between machine language and assembly language.

Part-B: 40 Long Answer Questions (10 Marks Each)

(Answer in ~400 words each)

Unit I: Binary Systems, Logic Gates, Boolean Algebra, K-Map

1. Explain number base conversions with examples: binary to decimal, octal to hex, and vice versa.
2. Convert $(1011101.101)_2$ to decimal, octal, and hexadecimal.
3. Perform binary subtraction using 1's and 2's complement for $(1001 - 1101)$.
4. Explain the types of binary codes with examples.
5. What are canonical and standard forms of Boolean expressions?
6. Simplify $F(A,B,C,D) = \Sigma(0,2,3,7,8,9,12,13)$ using a 4-variable K-map.
7. Describe the construction and truth table of NAND and NOR gates.
8. Prove the basic theorems of Boolean algebra with truth tables.
9. Design the logic circuit for a Boolean expression using only NOR gates: $F = AB + A'C$
10. Write the truth table and draw the circuit for an XOR gate using NAND gates.

Unit II: Arithmetic Circuits, Sequential Logic, Machine Instructions

11. Explain the working of a full adder with circuit diagram and truth table.

12. Design a 4-bit binary parallel adder using full adders.
13. Describe the BOOTH algorithm for signed number multiplication with an example.
14. Compare combinational and sequential logic circuits with diagrams.
15. Draw and explain the working of a 4-to-1 multiplexer with logic diagram.
16. Design a 3-to-8 decoder and explain its truth table.
17. Explain the construction and working of JK flip-flop.
18. Write short notes on: (a) D flip-flop (b) T flip-flop
19. Explain the race-around condition and how Master-Slave JK Flip-Flop avoids it.
20. What are addressing modes? Explain various types with examples.

Unit III: Assembly Language, I/O, and Memory System

21. Write an assembly program to add two numbers. Explain each step.
22. Discuss different types of interrupts and their handling mechanisms.
23. Explain memory-mapped I/O and isolated I/O with suitable diagrams.
24. What is the purpose of the page table in virtual memory? Explain with diagram.
25. Compare synchronous DRAM and asynchronous DRAM.
26. Explain the internal organization of memory chips.
27. Describe the working of cache memory. How does it improve performance?
28. Compare static RAM and dynamic RAM in terms of speed, size, and application.
29. Explain the role of buses in a computer system. Mention types of buses.
30. What is Direct Memory Access (DMA)? Explain its role in data transfer.
31. Define pseudo-instruction. How is it different from machine instruction?
32. Explain memory hierarchy with a neat diagram.
33. What is the role of stack in memory operations?
34. Differentiate between RISC and CISC architectures.
35. How is data stored and accessed in ROM?
36. Describe instruction sequencing and types of instructions.
37. What is interrupt-driven I/O? Compare it with polling method.
38. Explain the architecture and role of I/O controllers.
39. What are the memory management requirements in a computer system?
40. Write a short note on virtual memory and address translation.

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**Bachelor of Computer Applications (BCA)
(Part-I) (Semester-I) Examination, 2023
(Held in 2024)
BCA-102
Computer Architecture**

Duration of Examination: 3 Hours
परीक्षा की अवधि: 3 घण्टा

Max. Marks: 70
पूर्णांक: 70

Instructions to the Candidates:
परीक्षार्थी के लिए निर्देश:-

Note:- The question paper is divided into 02 Parts : Part- A & Part B.

Part-A

Will consist of 10 compulsory questions. There will be at least three questions from each unit and answer to each question shall be limited up to 50 words. Each question will carry 02 marks. Total 20 Marks. (Marks-10x2=20)

Part-B

Will consist of 10 questions. At least three questions from each unit be set and student will have to answer 05 questions, selecting At least one questions from each unit. The answer to each question shall be limited to 400 words. Each question carries 10 Marks. Total 50 Marks. (Marks-5x10=50)

Part-A (Compulsory)

- 1- Convert the hexadecimal number 2F to binary and decimal.
- 2- Define cache memory.
- 3- List basic computer registers with their functions.
- 4- Write the symbol and truth table for NAND gate.
- 5- State any two characteristics of a multiplexer.
- 6- What is DMA?
- 7- Draw logic circuit of half adder.
- 8- What is a weighted code?
- 9- Convert $(11011.11)_2$ in to decimal?
- 10- Write Truth table of XOR gate.

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Part-B (Compulsory)

- 11- Simplify the following Boolean function using four- variable map and draw the circuit diagram for the minimized expression. $F(w, x, y, z) = \sum(1, 3, 7, 4, 1, 5) + d(0, 2, 5)$.
- 12- What is flip flop? Explain the working of SR and JK flip flop with the help of symbol, logic circuit and Truth table.
- 13- What are the addressing modes? Explain the different types of addressing modes with example.
- 14- Explain the functioning of a full subtractor with its truth table and circuit diagram.
- 15- What are combinational blocks? Explain the working of a 3-to-8 line decoder with the help of logic symbol, logic diagram and truth table.
- 16- What are the differences between Assembly language and Machine Language? What is the use of pseudo instructions in Assembly language?
- 17- Convert the following number with indicated bases to decimal.
- (i) $(101111)_2$
 - (ii) $(A3B)_{16}$
 - (iii) $(237)_8$
 - (iv) $(43)_5$
- 18- Simplify the following Boolean expression to a minimum number of literals and draw the circuit diagram.
- (i) $F = (BC + AD)(AB + CD)$
 - (ii) $F = WYZ + XY + XZ + YZ$
- 19- Design a 4-to-1 multiplexer using basic logic gates. Provide the truth table and logical expressions for the inputs to the multiplexer. Explain how the multiplexer functions and how the output is determined based on the select lines.
- 20- Compare and contrast Dynamic RAM (DRAM) and Synchronous D-Ram (SDRAM). Discuss the advantages and disadvantages of each type. Explain how SDRAM improves performance compared to traditional DRAM.

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**Bachelor of Computer Applications (BCA)
(Part-I) (Semester-I) Examination , 2024
(Held in 2025)
BCA-102
Computer Architecture**

Duration of Examination: 3 Hours

Max. Marks: 70

परीक्षा की अवधि: 3 घण्टा

पूर्णांक: 70

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Instructions to the Candidates:

परीक्षार्थी के लिए निर्देश:-

Note:- The question paper is divided into 02 Parts: Part - A & Part-B.

Part-A

Will consist of 10 compulsory questions. Answer to each question shall be limited up to 50 words. Each question will carry 02 marks. Total 20 Marks.

(Marks-10×2=20)

Part-B

Will consist of 10 questions. Student will have to answer 05 questions, selecting At least one questions from each unit. The answer to each question shall be limited upto 400 words. Each question carries 10 marks. Total 50 Marks.

(Marks-5×10=50)

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Part-A

- 1- Convert the hexadecimal number $A3_{16}$ into binary.
- 2- Perform binary subtraction of 1010_2 and 0110_2 using r's expression.
- 3- Draw the truth table for a XOR gate and provide its Boolean expression.
- 4- Give the circuit diagram of NOR gate and write its truth table.
- 5- How can don't care conditions influence the optimization of combinational logic circuits?
- 6- What is the primary difference between a D Flip-Flop and JK Flip-Flop?
- 7- Define a Flip-Flop. How is it different from a latch?
- 8- Briefly explain the BOOTH algorithm for signed number multiplication.
- 9- What is the significance of the "page table" in virtual memory management?
- 10- What is the role of the memory bus in DMA data transfer?



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Part-B

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Unit-I

- + 11- (a) Design a circuit using only NAND gates to implement the function:
 $F(A,B) = A.B + A.B$
- (b) Explain why NAND and NOR gates are called universal gates.
- ✓ 12- Simplify the Boolean function $F(A,B,C,D) = \Sigma(0,1,2,4,5,6,8,9,10,12)$ $F(A,B,C,D)$ using a four - variable K-map. Draw the simplified circuit diagram using basic logic gates.
- + 13- (a) Convert 547_{10} to its binary, octal and hexadecimal forms.
- (b) Perform the arithmetic $1101.11_2 - 101.01_2$ in binary and express the result in decimal.
- ✓ 14- What are sequential circuits? Explain how they differ from combinational circuits.

Unit-II

- + 15- Design a 8-to-1 multiplexer using two 4-to-1 multiplexers and a 2-to-1 multiplexer. Provide the schematic diagram and explain the logic behind cascading multiplexers to achieve higher-order multiplexing.
- ✓ 16- Illustrate how different addressing modes affect instruction execution with suitable examples.
- + 17- Explain the construction and working of a Master - Slave JK Flip-Flop. How does it overcome the race-around condition?

Unit-III

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- ✓ 18- How are interrupts generated, and what is their significance in controlling I/O devices? Discuss the different types of interrupts and their handling mechanism.
- + 19- Provide an example of an assembly language program for adding two numbers and explain the steps involved in the program execution.
- ✓ 20- Compare the differences between static RAM (SRAM) and dynamic RAM (DRAM) in terms of structure, working and application.
