

| Satyug Darshan Institute of Technology, Faridabad |                                                                                                                                                                                                      |                                 |
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| Programme: BCA-DS                                 |                                                                                                                                                                                                      | Year: 1st<br>Semester: 1st sem  |
| Subject Name : Computer Organisation              |                                                                                                                                                                                                      | Subject<br>Code: BCG-1<br>05-V1 |
| Department of Computer Science and Engg.          |                                                                                                                                                                                                      | AY: 2025-2026                   |
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| Unit -1                                           |                                                                                                                                                                                                      |                                 |
| Short Questions                                   |                                                                                                                                                                                                      |                                 |
| S. No.                                            | Questions                                                                                                                                                                                            | Bloom Taxonomy                  |
| 1                                                 | Define Logic Gates.                                                                                                                                                                                  | KL1                             |
| 2                                                 | Differentiate between POS and SOP form.                                                                                                                                                              | KL1                             |
| 3                                                 | Define Parity bit.                                                                                                                                                                                   | KL2                             |
| 4                                                 | Perform the addition : $(235)_{16} + (563)_8$                                                                                                                                                        | KL1                             |
| 5                                                 | Convert into gray code for $(100100011)_2$                                                                                                                                                           | KL1                             |
| 6                                                 | Convert the following–<br>(i) $(34.25)_{10} = (---)_2$ , (ii) $4F + 2D_{16} = (---)_{10}$ , (iii) $(1101)_2 * (101)_2 = (---)_2$ , (iv) $(35)_8 - (26)_8 = (---)_8$ , (v) $(7A3F)_{16} = (---)_{10}$ | KL2                             |
| 7                                                 | Simplify using Boolean laws: $A + A'B$                                                                                                                                                               | KL2                             |
| 8                                                 | Explain min-terms and max-terms with the help of a suitable example.                                                                                                                                 | KL1                             |
| 9                                                 | Define cell, pair, quad and octet in K-map.                                                                                                                                                          | KL1                             |
| 10                                                | Given the reason why we are using K-map and Boolean laws in designing the digital circuit.                                                                                                           | KL1                             |
| 11                                                | Design XOR gate using only NOR gates.                                                                                                                                                                | KL2                             |
| 12                                                | Convert the binary code $(1001101)_2$ to Gray Code.                                                                                                                                                  | KL2                             |
| 13                                                | Write the excess-3 code of $(124)_{10}$ .                                                                                                                                                            | KL2                             |
| 14                                                | Explain self-complementing codes.                                                                                                                                                                    | KL2                             |
| 15                                                | Given the data word 01011011 generate the Hamming code for error detection and correction.                                                                                                           | KL2                             |
| 16                                                | State and prove De Morgan's Theorem.                                                                                                                                                                 | KL2                             |
| Long Questions                                    |                                                                                                                                                                                                      |                                 |
| 1                                                 | Define Von Neumann Architecture. Explain its major components with a diagram.                                                                                                                        | KL2                             |
| 2                                                 | Solve the following:<br>(i) $(34)_{10} - (56)_{10}$ using 2's complement method.<br>(ii) $(12)_8 * (25)_8$                                                                                           | KL2                             |
| 3                                                 | Define universal gates. Explain why these gates are called universal gates.                                                                                                                          | KL2                             |
| 4                                                 | Explain Hamming code. Encode a binary word 11001 into the even parity hamming code.                                                                                                                  | KL2                             |
| 5                                                 | Differentiate between SOP and POS forms with suitable examples.                                                                                                                                      | KL2                             |
| 6                                                 | Define Boolean Algebra. State its basic laws and theorems.                                                                                                                                           | KL2                             |
| 7                                                 | Simplify the following function into minimal form using K-Maps and design the circuit<br>$f(A, B, C, D) = \sum m(0, 1, 2, 5, 8, 9, 10)$                                                              | KL3                             |
| 8                                                 | Implement the following Boolean function with NAND gates. $f(A, B, C) = \sum m(1, 2, 3, 4, 5, 7)$                                                                                                    | KL3                             |
| 9                                                 | Write -28 and +28 in Sign-magnitude representation, 1's Complement representation and 2's Complement representation.                                                                                 | KL3                             |
| 10                                                | Perform the following using 1's C and 2's C : (i) $-89 + 32$ (ii) $-23 - 46$                                                                                                                         | KL3                             |

| 11                     | Differentiate between combinational and sequential circuits.                                                                                    | KL3            |
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| 12                     | Simplify using K map and implement using only NAND gates:<br>$F(A, B, C, D) = \prod M(0, 1, 2, 3, 4, 10, 11) + \prod d(5, 9)$                   | KL3            |
| 13                     | What are the error detection and correction codes? How these are helpful in error detection and correction explain with the help of an example. | KL3            |
| 14                     | "Implement the following function using Boolean algebra<br>$F(A, B, C, D) = \sum m(2, 3, 4, 6, 7)$ ."                                           | KL3            |
| <b>Unit -2</b>         |                                                                                                                                                 |                |
| <b>Short Questions</b> |                                                                                                                                                 |                |
| S. No.                 | Questions                                                                                                                                       | Bloom Taxonomy |
| 1                      | Differentiate between JK and SR flip-Flop.                                                                                                      | KL1            |
| 2                      | Define flip-flop. How it is different from latch.                                                                                               | KL2            |
| 3                      | Discuss briefly 4:1 Multiplexer.                                                                                                                | KL1            |
| 4                      | Write the application of shift register.                                                                                                        | KL2            |
| 5                      | How can a DEMUX be used as a decoder?                                                                                                           | KL1            |
| 6                      | Discuss briefly 1:4 Demultiplexer.                                                                                                              | KL2            |
| 7                      | Give some of the major applications of multiplexers.                                                                                            | KL2            |
| 8                      | Realize AND and OR function using 2:1 MUX.                                                                                                      | KL2            |
| 9                      | Implement the following function using Boolean algebra<br>$F(A, B, C, D) = \sum m(2, 3, 4, 6, 7)$ .                                             | KL3            |
| 10                     | Explain 3-to 8-line decoder.                                                                                                                    | KL2            |
| <b>Long Questions</b>  |                                                                                                                                                 |                |
| 1                      | Explain one bit memory cell. Make T flip-flop using D-flip-flop                                                                                 | KL2            |
| 2                      | Define decoder. Draw and explain the operation of 2-to-4 line decoder.                                                                          | KL2            |
| 3                      | Define Multiplexer. Implement 16:1 MUX with 8:1 MUX.                                                                                            | KL4            |
| 9                      | Differentiate between combinational and Sequential circuit. Explain operation of JK flip-flop.                                                  | KL3            |
| 10                     | Draw and explain the diagram of parallel input serial out shift register                                                                        | KL3            |
| 11                     | Explain a 4-bit register with parallel load using block diagram.                                                                                | KL3            |
| 12                     | Explain half adder and full adder with truth table and logic diagram.                                                                           | KL3            |
| 1                      | Explain binary half and Full adder subtractor with logic diagram.                                                                               | KL3            |
| 14                     | Explain bidirectional shift register with parallel load.                                                                                        | KL3            |
| 15                     | Compare synchronous and asynchronous counters.                                                                                                  | KL3            |
| 16                     | Explain 4-bit asynchronous (ripple) binary counter with timing diagram.                                                                         |                |
| 17                     | Explain 4-bit synchronous (ripple) binary counter with timing diagram.                                                                          |                |
| <b>Unit -3</b>         |                                                                                                                                                 |                |
| <b>Short Questions</b> |                                                                                                                                                 |                |
| S. No.                 | Questions                                                                                                                                       | Bloom Taxonomy |
| 1                      | Define an instruction code.                                                                                                                     | KL1            |
| 2                      | Explain the role of computer registers.                                                                                                         | KL2            |
| 3                      | List different types of computer instructions.                                                                                                  | KL1            |
| 4                      | What is meant by timing and control in a computer?                                                                                              | KL2            |
| 5                      | Define instruction cycle.                                                                                                                       | KL1            |
| 6                      | Explain memory-reference instructions.                                                                                                          | KL2            |
| 7                      | What is an interrupt?                                                                                                                           | KL1            |
| 8                      | State the purpose of input-output interrupt.                                                                                                    | KL2            |
| 9                      | Define accumulator.                                                                                                                             | KL1            |

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| 10                    | Explain stack organization.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | KL2                   |
| 11                    | What is an instruction format?                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | KL1                   |
| 12                    | List any two addressing modes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | KL1                   |
| 13                    | Explain RISC architecture.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | KL2                   |
| 14                    | Write one difference between RISC and CISC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | KL2                   |
| 15                    | What are program control instructions?                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | KL2                   |
| <b>Long Questions</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                       |
| <b>S. No.</b>         | <b>Questions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Bloom Taxonomy</b> |
| 1                     | Explain instruction codes and computer registers with suitable examples.                                                                                                                                                                                                                                                                                                                                                                                                                                     | KL2                   |
| 2                     | Describe different types of computer instructions.                                                                                                                                                                                                                                                                                                                                                                                                                                                           | KL2                   |
| 3                     | Explain the timing and control unit of a basic computer with diagram.                                                                                                                                                                                                                                                                                                                                                                                                                                        | KL3                   |
| 4                     | Explain the instruction cycle with a neat diagram.                                                                                                                                                                                                                                                                                                                                                                                                                                                           | KL2                   |
| 5                     | Discuss memory-reference instructions in detail.                                                                                                                                                                                                                                                                                                                                                                                                                                                             | KL3                   |
| 6                     | Explain input-output interrupts and their working.                                                                                                                                                                                                                                                                                                                                                                                                                                                           | KL2                   |
| 7                     | Describe the complete computer system with block diagram.                                                                                                                                                                                                                                                                                                                                                                                                                                                    | KL3                   |
| 8                     | Explain the design of a basic computer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | KL3                   |
| 9                     | Explain the design and working of accumulator logic.                                                                                                                                                                                                                                                                                                                                                                                                                                                         | KL3                   |
| 10                    | Describe general register organization of CPU.                                                                                                                                                                                                                                                                                                                                                                                                                                                               | KL2                   |
| 11                    | Explain stack organization and its operations.                                                                                                                                                                                                                                                                                                                                                                                                                                                               | KL3                   |
| 12                    | Explain instruction formats with suitable examples.                                                                                                                                                                                                                                                                                                                                                                                                                                                          | KL2                   |
| 13                    | Explain different addressing modes with examples.                                                                                                                                                                                                                                                                                                                                                                                                                                                            | KL3                   |
| 14                    | Discuss data transfer and manipulation instructions.                                                                                                                                                                                                                                                                                                                                                                                                                                                         | KL3                   |
| 15                    | Explain program control instructions in detail.                                                                                                                                                                                                                                                                                                                                                                                                                                                              | KL3                   |
| 16                    | Explain RISC architecture and its advantages.                                                                                                                                                                                                                                                                                                                                                                                                                                                                | KL2                   |
| 17                    | Compare RISC and CISC architectures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | KL4                   |
| 18                    | <p>Given the following information:<br/> Program Counter (PC) = 300</p> <p>Index Register (XR) = 40</p> <p>Base Register (BR) = 1000</p> <p>Instruction address = 300</p> <p>Address field of instruction = 200</p> <p>Memory contents:</p> <p>M[200] = 800</p> <p>M[240] = 600</p> <p>Calculate the Effective Address (EA) for the following addressing modes:</p> <p>Direct Addressing</p> <p>Indirect Addressing</p> <p>Indexed Addressing</p> <p>Base Register Addressing</p> <p>Relative Addressing</p> | KL3                   |

| 19                     | <p>Given:</p> <p>PC = 400</p> <p>Index Register (XR) = 60</p> <p>Base Register (BR) = 500</p> <p>Address field = 120</p> <p>Memory contents:</p> <p>M[120] = 900</p> <p>M[180] = 300</p> <p>Find the Effective Address (EA) for:</p> <p>Direct addressing</p> <p>Indirect addressing</p> <p>Indexed addressing</p> <p>Base register addressing</p> <p>Relative addressing</p> | KL3                   |
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| <b>UNIT-4</b>          |                                                                                                                                                                                                                                                                                                                                                                               |                       |
| <b>Short Questions</b> |                                                                                                                                                                                                                                                                                                                                                                               |                       |
| <b>S. No.</b>          | <b>Questions</b>                                                                                                                                                                                                                                                                                                                                                              | <b>Bloom Taxonomy</b> |
| 1                      | Define parallel processing.                                                                                                                                                                                                                                                                                                                                                   | KL1                   |
| 2                      | What is pipelining in computer architecture?                                                                                                                                                                                                                                                                                                                                  | KL2                   |
| 3                      | Define arithmetic pipeline.                                                                                                                                                                                                                                                                                                                                                   | KL1                   |
| 4                      | What is an instruction pipeline?                                                                                                                                                                                                                                                                                                                                              | KL2                   |
| 5                      | What is RISC pipeline?                                                                                                                                                                                                                                                                                                                                                        | KL2                   |
| 6                      | Define peripheral devices.                                                                                                                                                                                                                                                                                                                                                    | KL1                   |
| 7                      | What is an input–output interface?                                                                                                                                                                                                                                                                                                                                            | KL1                   |
| 8                      | What is asynchronous data transfer?                                                                                                                                                                                                                                                                                                                                           | KL2                   |
| 9                      | List different modes of data transfer.                                                                                                                                                                                                                                                                                                                                        | KL1                   |
| 10                     | What is a priority interrupt?                                                                                                                                                                                                                                                                                                                                                 | KL2                   |
| 11                     | Define Direct Memory Access (DMA).                                                                                                                                                                                                                                                                                                                                            | KL1                   |
| 12                     | What is an Input–Output Processor (IOP)?                                                                                                                                                                                                                                                                                                                                      | KL1                   |
| 13                     | Define memory hierarchy.                                                                                                                                                                                                                                                                                                                                                      | KL1                   |
| 14                     | What is main memory?                                                                                                                                                                                                                                                                                                                                                          | KL1                   |
| 15                     | What is auxiliary memory?                                                                                                                                                                                                                                                                                                                                                     | KL1                   |
| 16                     | Define associative memory.                                                                                                                                                                                                                                                                                                                                                    | KL2                   |
| 17                     | What is cache memory?                                                                                                                                                                                                                                                                                                                                                         | KL1                   |
| 18                     | Define virtual memory.                                                                                                                                                                                                                                                                                                                                                        | KL2                   |
| 19                     | What is memory management hardware?                                                                                                                                                                                                                                                                                                                                           | KL1                   |
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| <b>Long Questions</b>  |                                                                                                                                                                                                                                                                                                                                                                               |                       |
| <b>S. No.</b>          | <b>Question</b>                                                                                                                                                                                                                                                                                                                                                               | <b>Bloom Taxonomy</b> |
| 1                      | Explain parallel processing and its advantages.                                                                                                                                                                                                                                                                                                                               | KL2                   |
| 2                      | Explain the concept of pipelining with suitable examples.                                                                                                                                                                                                                                                                                                                     | KL3                   |
| 3                      | Describe the working of an arithmetic pipeline with diagram.                                                                                                                                                                                                                                                                                                                  | KL3                   |
| 4                      | Explain instruction pipeline and its hazards.                                                                                                                                                                                                                                                                                                                                 | KL3                   |

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| 5  | Explain the working of RISC pipeline.                                                                                                                                                                                                                                                          | KL2 |  |
| 6  | Explain different types of peripheral devices.                                                                                                                                                                                                                                                 | KL2 |  |
| 7  | Describe input–output interface in detail.                                                                                                                                                                                                                                                     | KL2 |  |
| 8  | Explain asynchronous data transfer with handshaking.                                                                                                                                                                                                                                           | KL3 |  |
| 9  | Discuss various modes of data transfer.                                                                                                                                                                                                                                                        | KL2 |  |
| 10 | Explain priority interrupt with suitable diagram.                                                                                                                                                                                                                                              | KL3 |  |
| 11 | Describe Direct Memory Access (DMA) and its working.                                                                                                                                                                                                                                           | KL3 |  |
| 12 | Explain the role of Input–Output Processor (IOP).                                                                                                                                                                                                                                              | KL2 |  |
| 13 | Explain memory hierarchy and its characteristics.                                                                                                                                                                                                                                              | KL2 |  |
| 14 | Describe main memory organization.                                                                                                                                                                                                                                                             | KL2 |  |
| 15 | Explain auxiliary memory and its types.                                                                                                                                                                                                                                                        | KL2 |  |
| 16 | Explain associative memory with suitable example.                                                                                                                                                                                                                                              | KL3 |  |
| 17 | Explain cache memory organization and mapping techniques.                                                                                                                                                                                                                                      | KL3 |  |
| 18 | Explain virtual memory and address translation.                                                                                                                                                                                                                                                | KL3 |  |
| 19 | Describe memory management hardware in detail.                                                                                                                                                                                                                                                 | KL3 |  |
| 20 | A pipeline has 5 stages, each taking 20 ns. Calculate:<br>(a) Time to execute 1 instruction<br>(b) Time to execute 10 instructions<br>(c) Speedup over non-pipelined execution                                                                                                                 | KL3 |  |
| 21 | A processor uses a 5-stage instruction pipeline, where each stage takes 10 ns. The processor executes 20 instructions. Calculate:<br>(a) Total execution time using pipelining<br>(b) Speedup compared to non-pipelined execution<br>(c) Throughput of the pipeline<br>(d) Pipeline efficiency | KL3 |  |