DIGITAL COMPUTER ORGANIZATION

Code: 31511 | Total Units: 14 | Total Questions Analyzed: 2022, 2023, 2024

UNIT 1 — NUMBER SYSTEMS (Pages 1–30)

Part A

- (3×) Find / state / use 2's-complements / binary subtraction questions
  - Subtract 111001_2 from 101011_2 using 2's complement method. (2022)
  - Find 2's complements for 1000 0001, 0011 0110. (2024)
- (2×) State the steps involved in Gray to binary conversion. (2022, 2023)
- (1×) How many types of number systems are there? (2023)

Part B

- No Part B specific items for Unit 1.

Part C

- No Part C specific items for Unit 1.

UNIT 2 — BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUITS (Pages 31–52)

Part A

- No direct short Part A items unique to Unit 2 in 2024.

Part B

- (3×) Fundamental laws of Boolean algebra / De Morgan's theorems / simplification using Boolean algebra. (2022, 2023, 2024)
- (1×) Write about Quine–McCluskey method. (2022)

Part C

- See Unit 3 for K-map simplification.

UNIT 3 — SIMPLIFICATION OF EXPRESSIONS (Pages 53–81)

Part A

- No short Part A items.

Part B

- (3×) Quine–McCluskey / simplification methods questions. (2022, 2023, 2024)

Part C

- (3×) K-map simplification problems (different minterm sets)
    - Simplify a Boolean function using K–map and implement logic circuit. (2022 Q16)
    - K-map simplification with don't cares. (2023 Q16)
    - K-map F(A,B,C,D)=Σ(0,2,4,5,6,7,8,10,13,15). (2024 Q16)

UNIT 4 — COMBINATIONAL CIRCUITS (Pages 82–101)

Part A

- (3×) Encoder / priority encoder questions (present in all three years). (2022, 2023, 2024)
- (1×) What is combinational circuit with example? (2023)
- (1×) What is meant by full adder? (2024)

Part B

- (3×) Multiplexer explanation / sketch
    - With a neat sketch, explain Multiplexer. (2022 Q12a)
    - What is Encoder? Give the functional logic of Encoder. (2023 Q12a)
    - Give a brief account on half adder and full adder. (2024 Q12a)

Part C

- (2×) Half adder / full adder explanation (2022 & 2023; 2024 mapped to flip-flop unit)
    - With a neat sketch, explain half adder and full adder. (2022 Q17)

UNIT 5 — SEQUENTIAL CIRCUITS (Pages 102–129)

Part A

- (3×) Flip-flop operations / types (SR/RS/T/J-K/D) / "Write operations of RS flip-flop" / "List and explain two flip-flops". (2022, 2023, 2024)
- (1×) Define shift register. (2022)
- (1×) What is latch? (2024)

Part B

- (3×) Counters / BCD counter questions (present across years)
    - What is counter? Explain BCD counter. (2022 Q12b)
    - Construct the logic diagram of JK flip–flop with truth table. (2023 Q12b)

Part C

- (3×) Critically evaluate / list and explain the functions of any two flip-flops. (2023 Q17, 2024 Q17)

UNIT 6 — DATA REPRESENTATION (Pages 130–153)

Part A / B / C

- No mapped questions in 2022/2023 exam years.
- (1×) Describe floating point representation with examples. (2024 Q12b)

UNIT 7 — INSTRUCTION CODES (Pages 154–162)

Part A

- (3×) Computer registers / accumulator / registers and functions (repeated in all three years)
    - What are computer registers? (2022)
    - Define the term Accumulator. (2022)
    - What are memory reference instructions? (2024)

Part B

- (3×) Discuss / briefly explain computer registers. (2022 Q13a, 2023 Q13a, 2024 Q13a)
- (3×) Brief on the design of accumulator logic. (2022 Q13b, 2023 Q13b, 2024 Q13b)

Part C

- No unique Part C items mapped here.

UNIT 8 — INSTRUCTION CYCLE (Pages 163–176)

Part A

- No Part A specific items.

Part B

- (3×) Memory reference instructions / explain memory-reference instruction cycle / addressing
    - Give a brief account on memory reference instructions. (2022 Q13b)
    - (2023 Q13b reference)
    - What is meant by addressing? (2024)

Part C

- (3×) Explain / elaborate the various phases of instruction cycle / memory reference instruction cycle. (2022 Q18, 2023 Q18, 2024 Q18)

UNIT 9 — INTRODUCTION TO CPU (Pages 177–189)

Part A

- No new Part A in 2024.

Part B

- (1×) Briefly explain about stack organization. (2022 Q14a)

Part C

- No Part C items.

UNIT 10 — INSTRUCTION FORMATS (Pages 190–216)

Part A

- (1×) Define Addressing modes. (2023)
- (1×) What is Register? (2023)
- (1×) What is Bus? Draw the single bus structure. (2023)
- (1×) Define the term stack. (2024)
- (1×) What are the modes of transfer? (2024)

Part B

- (2×) Summarize / list the different types of addressing modes. (2023 Q14a, 2024 Q14a)

Part C

- (2×) Examine / explain the three or four types of instruction formats with examples. (2023 Q19, 2024 Q19)

UNIT 11 — INPUT-OUTPUT ORGANISATION (Pages 217–236)

Part A

- (3×) Peripheral devices / list devices
    - List any four peripheral devices. (2022)
    - (2023)
    - Write short notes on peripheral devices. (2024 Q14b)
- (1×) What is read and write operation? (2022)

Part B

- (3×) Modes of data transfer / DMA & IOP discussion — appears in all three years
    - List and explain various modes of transfer. (2022 Q14b)
    - Write a short note on DMA and IOP. (2023 Q14b)

Part C

- (3×) DMA transfer explanation/diagram. (2022 Q19, 2023 Q19, 2024 Q19)
    - Explain DMA transfer / use of DMA controller with diagram. (2022 Q19)
    - (2023 Q19 theme)
    - (2024 Q19)

UNIT 12 — PRIORITY INTERRUPT / DMA (Pages 237–253)

Part A / B

- No unique short Part A/B items in 2024 beyond I/O overlap.

Part C

- (3×) DMA/IOP / priority interrupt questions present across years. (2022, 2023, 2024)

UNIT 13 — MEMORY (Pages 254–268)

Part A

- (3×) Cache-related questions
    - (2022)
    - State the characteristics of RAM. (2023)

    - Mention the uses of cache memory. (2023)
    - Differentiate between static and dynamic RAM. (2024)
    - What are significance of levels of cache? (2024)
- (1×) What is virtual memory? (2022)
- (1×) What is read and write operation? (2022)

Part B

- (3×) Write a note on / explain auxiliary memory and its types. (2022 Q15a, 2023 Q15a, 2024 Q15a)
- (3×) Give a brief account on associative memory / discuss associative memory. (2022 Q15b, 2023 Q15b, 2024 Q15a)

Part C

- No Part C unique items.

UNIT 14 — MEMORY ORGANISATION (Pages 269–274)

Part A

- (3×) Virtual memory question / translation of virtual to physical address
    - What is virtual memory? (2022)
    - (2023)
    - Demonstrate the concepts of virtual memory and address translation. (2024 Q15b)

Part B

- (3×) Cache memory uses / significance of levels (present all three years)
    - (2022)
    - (2023)
    - (2024)

Part C

- (3×) Describe / write detailed notes on memory hierarchy with neat diagram. (2022 Q20, 2023 Q20, 2024 Q20)