

2025

COMPUTER SCIENCE — MINOR

Paper : MN-1

(Computer Fundamental and Digital Logic)

Full Marks : 75

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

1. Answer **any five** questions : 2×5
- (a) Convert  $(110101.01)_2$  into its decimal equivalent.
  - (b) What is the function of control unit in CPU?
  - (c) Define Gray code.
  - (d) What is a full adder?
  - (e) What is fan-in, fan-out?
  - (f) Define parity bit.
  - (g) What is race around condition?
  - (h) Write two difference between RAM and ROM.

Answer **any three** questions.

2. (a) Explain the classification of computers with example.  
(b) Distinguish between system software and application software. 3+2
3. Explain weighted and non-weighted number system with suitable example. 5
4. State and prove De-Morgans theorems using Boolean algebra. 5
5. Explain fixed-point and floating point number representation with suitable examples. 5
6. (a) Write the boolean expression and truth table of a half adder.  
(b) Design the half adder using NAND gates only. 2+3

Answer **any five** questions.

7. (a) Simplify the Boolean function using Karnaugh map :  
 $F(A, B, C, D) = \sum (1, 3, 4, 5, 7, 9, 11, 15)$ .  
(b) Implement the simplified function using NAND gates only. 6+4

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8. (a) Design a 4 bit parallel adder using logic gates and explain its operation.  
(b) What is carry look ahead adder? Explain its advantage. 7+3
9. (a) Design a 4:1 multiplexer using logic gates.  
(b) Realize AND and OR Logic functions using 4:1 MUX. 5+5
10. (a) Explain the working of 3-to-8 decoder with the help of a neat diagram.  
(b) Design a binary to Excess-3 code converter with basic logic gates only. 5+5
11. (a) Explain the working of J-K flip-flop with the help of its truth table.  
(b) How can a D flip-flop be converted into a J-K flip-flop using additional logic gates? Draw the logic diagram and explain the working principle of the conversion. 4+6
12. Design and explain 4-bit asynchronous UP-counter using J-K flip-flops and draw the timing diagram. 7+3
13. (a) Explain the different types of registers with the help of neat diagram.  
(b) What is universal shift register? Why is it considered versatile compared to other registers? 7+3
14. (a) What is Priority Encoder? Design a four input two output priority encoder using basic logic gates.  
(b) What is parity checker? Explain briefly. 6+4
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