

2024

COMPUTER SCIENCE — MINOR

Paper : MN-1

(Computer Fundamentals 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) What is a weighted code, and how does it differ from a non-weighted code? Give examples.
  - (b) Realize the expression,  $F = A \cdot B + \bar{C} \cdot \bar{D}$  using NAND logic gates only.
  - (c) Highlight the main differences between combinational and sequential digital circuits.
  - (d) What are the differences between a synchronous counter and an asynchronous counter?
  - (e) Convert  $(2397)_{10}$  to  $( ? )_{16}$ .
  - (f) What is half adder? Draw the logic circuit diagram.
  - (g) Realize an EX-OR gate by NAND gates only.
  - (h) What is the difference between multiplexer and demultiplexer?

**Section - A**

Answer **any three** questions.

2. Realize a 3-bit full adder using 8 to 1 multiplexer. Explain the design, draw the truth table of full adder and draw the appropriate logic circuit diagram. 2+1+2
3. 'Multiplexers are functionally complete' – Justify the statement. 5
4. Realize all the basic logic gates using NOR logic gates only. Explain with proper illustrations. 5
5. (a)  $y = \sum m (0, 5, 10, 11, 12, 13, 15)$ . Draw k-map and simplify.  
(b) Implement the simplified expression by logic gates. 3+2
6. Explain the working of 4 input priority encoder with proper illustrations. 5

Please Turn Over

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**Section - B**

Answer *any five* questions.

7. (a) Construct a 2-bit  $\times$  2-bit multiplier using two logic gates.  
(b) State and prove De-Morgan's theorem. 5+5
8. (a) Design an asynchronous decode counter using negative edge triggered J-K flip-flop and necessary logic gates.  
(b) Draw the appropriate logic circuit diagram. Draw the truth table. 5+3+2
9. What is Fan-out with respect to TTL logic circuits? Explain the working of a TTL Inverter along with appropriate logic circuits diagram. 2+5+3
10.  $y = \Sigma (0, 4, 7, 8, 13, 15)$ . Implement the logical expression by 8:1 multiplexer with truth table. 8+2
11. (a) Simplify  $y = \Sigma m (0, 1, 3, 5, 7) + \Sigma d (2, 4, 6, 10)$  using Karnaugh map and derive the boolean expression.  
(b) Draw the logic circuit diagram using basic logic gates. 3+4+3
12. Explain the working of 2 to 4 decoder with active low output. Draw the truth table and design the decoder using NAND logic gates only. Draw the appropriate logic circuit diagram. 2+4+4
13. Design a BCD to excess-3 code converter using basic logic gates. Explain. 8+2
14. (a) Simplify the boolean expression  $y = (A + \bar{B}) \cdot (\bar{A} \cdot B + A \cdot C) \cdot (\bar{A} \cdot \bar{C} + \bar{B})$ . Realize the simplified Boolean Expression using basic logic gates only.  
(b) Design an S – R flip-flop. Explain with truth table. 5+5
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