

2022

COMPUTER SCIENCE — HONOURS

Paper : CC-1

(Digital Logic)

Full Marks : 50

The figures in the margin indicate full marks.

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

Answer **question no. 1** and **any four** from the rest.

1. Answer **any five** questions of the following : 2×5
 - (a) What is a multiplexer?
 - (b) What is the function of a parity checker?
 - (c) Convert $(2D5.1A)_{16} = (?)_2$.
 - (d) State De Morgan's theorems.
 - (e) What is the difference between a latch and a flip-flop?
 - (f) What is edge triggering?
 - (g) What are quads and octets?
 - (h) What is comparator?
2. (a) Simplify the logic expression $F = \sum m(1,3,4,7,9,12)$ by K-map method. Draw the truth table.
(b) Design the circuit by using the simplified expression. 5+5
3. (a) Implement the following function with a 8×1 multiplexer :
$$F(A, B, C, D) = \sum (1,4,6,8,10,12).$$

(b) Implement the above mentioned logic function by $1:16$ demultiplexer. 5+5
4. (a) Draw the circuit diagram of a J-K master-slave flip-flop. Explain its function.
(b) Explain the Race-around problem and how can this be overcome. 5+5
5. (a) Design a counter with a count sequence of 000-001-010-011-000; using flip-flops.
(b) What is a D flip-flop? 7+3

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6. (a) Draw the circuit diagram of a 3-bit full adder and also write down its truth table.
(b) Design the Y_{sum} of the 3-bit full adder by NAND gates only. 6+4
7. (a) Show how NAND and NOR gates operate as universal gates.
(b) Design a half subtractor using, 4×1 multiplexer. 7+3
8. (a) Design a 3-bit comparator using logic gates. Draw the truth table.
(b) What is the difference between combinational and sequential circuits? 8+2
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