2025

COMPUTER SCIENCE — HONOURS

Paper : DSCC-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 the main difference between a sequential and a combinational circuit?

(b) State De-Morgan's theorems.

(c) What is the difference between a pulse and a clock?

(d) Compare among Super, Mainframe and Personal computers.

(e) What is an implementation table?

(f) State difference between SOP and POS.

(g) Convert $(10110100)_2$ to decimal equivalent.

(h) What is ASCII code?

Answer ***any three*** questions.

2. Design a 3-bit full subtractor using basic logic gates. 5

3. Show that NAND is a universal logic gate. 5

4. Draw the circuit diagram of a 3-bit full-adder using two 4×1 MUX. 5

5. (a) What is S-R flip-flop? Draw the circuit diagram of S-R flip-flop and explain its function with truth table.

(b) Draw the circuit diagram of a de-bouncer. 3+2

6. Implement a multiplier (A_1 A_0 multiplied by B_1 B_0) circuit and explain. 5

Please Turn Over

Answer ***any five*** questions.

7. (a) Design a parity checker and generator circuit for 3-bit data.

(b) Explain how one can overcome the race around condition for a JK flip-flop. Give diagram. 5+5

8. (a) Design a synchronous MOD-5 DOWN counter.

(b) Show the timing diagram. 7+3

9. Implement the function :

(a) F (A, B, C, D) = $\sum$ (1, 4, 6, 10, 12, 14) using 16 : 1 MUX.

(b) Implement the above function by 8 : 1 MUXs. 4+6

10. (a) Draw the circuit diagram of an adder/subtractor unit. Explain its operation.

(b) Implement XOR using NAND or NOR gates. 7+3

11. (a) What are the different types of registers?

(b) Explain the operation of shift left and shift right registers. 4+6

12. (a) Minimize the function using K-map $Y=\sum_m (1, 2, 6, 7, 8, 13, 14, 15)+\sum_d(3, 5, 12)$ and draw the circuit using logic gates.

(b) Simplify the following expression using K-map in POS form $Y=\pi(3, 5, 7, 8, 10, 11, 12, 13)$. 6+4

13 (a) Draw the circuit diagram of a Master-slave J-K flip-flop and explain its operation.

(b) What is the utility of Toggle Flip-Flop? 8+2

14. Write notes on (***any two***) : 5×2

(a) ROM

(b) Clock and latch

(c) CACHE

(d) Parallel adder.
