

1. All questions are compulsory.
2. All questions carry equal marks.
3. Draw neat, labelled diagrams wherever necessary.

1. Attempt the following (Any three)**(15 Marks)**

- a. Explain Decimal and Binary number system in detail.
- b. Write a short note on basic gates.
- c. Construct AND, OR and NOT gates using NAND gate.
- d. Perform the binary subtraction using 2's complement method
 - (i) $(56)_{10} - (76)_{10}$
 - (ii) $(11)_{10} - (22)_{10}$
- e. What are the different types of codes used in digital systems? Explain any two.
- f. Solve the following.
 - (i) $(1011001)_{\text{Gray}} = (?)_2$
 - (ii) $(100101)_2 = (?)_{\text{Gray}}$

2. Attempt the following (Any three)**(15 Marks)**

- a. State and explain Demorgan's first and second theorems.
- b. Define Duality theorem and give example.
- c. Explain any two postulates of Boolean algebra.
- d. Write a short note on K-map. Draw the structure of k-map for 4 variable SOP and POS form.
- e. Simplify using K-map and realize it using minimum number of gates:
 $f(A,B,C,D) = \sum m(1,3,7,11,15) + d(0,2,5)$
- f. Simplify using K-map and realize it using minimum number of gates.
 $F(A,B,C,D) = \prod M(4,6,11,14,15)$

3. Attempt the following (Any three)**(15 Marks)**

- a. What is Demultiplexer? Explain 1:2 demultiplexer.
- b. Draw and explain the working of full subtractor.
- c. Draw circuit and explain working of half Adder.
- d. Design the half Subtractor using K-map. Draw the circuit diagram for the same.
- e. What is Multiplexer? Explain 4:1 Multiplexer.
- f. Draw and explain full adder.

4. Attempt the following (Any three)**(15 Marks)**

- a. Draw and explain Serial-In-Serial-Out shift Register.
- b. Draw and explain Asynchronous Counter.
- c. Draw and explain Parallel-In-Parallel-Out shift Register.
- d. Write a short note on S-R Latch flip flop.
- e. How T flip-flop can be used to work as SR flip-flop? Explain.
- f. Explain applications of flip flops.

5. Attempt the following (Any three)**(15 Marks)**

- a. How does an Arithmetic-Logic Unit work?
- b. Draw and explain 4 bit Parallel Adder using look ahead carry generator.
- c. Write a short note on Booth's Multiplication algorithm.
- d. Design a Look-ahead carry generator for 8-bits using IC 74182
- e. Solve: $(1010011)_2 \times (110)_2$
- f. Solve: $(1010100101)_2 \div (101)_2$
