

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. Convert the following.
 - (i) $(12.122)_{10} = (?)_{16}$
 - (ii) $(725)_8 = (?)_{10}$
- b. What are the different types of codes used in digital systems? Explain any two.
- c. Construct AND, OR and NOT gates using NOR gate.
- d. Write a short note on basic gates.
- e. Perform the binary subtraction using 2's complement method
 - (i) $(52)_{10} - (65)_{10}$
 - (ii) $(62)_{10} - (99)_{10}$
- f. Solve the following.
 - (i) $(1011010111)_{\text{Gray}} = (?)_2$
 - (ii) $(11010111)_2 = (?)_{\text{Gray}}$

2. Attempt the following (Any three)

(15 Marks)

- a. Explain any two postulates of Boolean algebra.
- b. Define Duality theorem and give example.
- c. Express the following Boolean expression on the K-map:

$$Y = A'B'C' + A'BC + AB'C + ABC'$$
- d. Simplify using K-map and realize it using minimum number of gates:

$$f(A,B,C,D,E) = \sum m(0,1,5,8,10,13,18,21,25,27,29,31)$$
- e. Simplify using K-map and realize it using minimum number of gates.

$$F(A,B,C,D) = \prod M(1,5,8,10,12,13,15) + d(0,2,5)$$
- f. State and explain Demorgan's theorems.

3. Attempt the following (Any three)

(15 Marks)

- a. What is Multiplexer? Explain 4:1 Multiplexer.
- c. Draw circuit and explain working of Half Adder.
- d. Design the Full Subtractor using K-map. Draw the circuit diagram for the same.
- e. What is Demultiplexer? Explain 1:2 Demultiplexer
- 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.
- 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. Solve the following.
 - (i) 1010011×110
 - (ii) $(10101011)_2 \div (101)_2$
- d. Write a short note on Booth's Multiplication algorithm.
- e. Solve the following.
 - (i) 10110011×1001
 - (ii) $(1010010110)_2 \div (1001)_2$
- f. Design a Look-ahead carry generator for 8-bits using IC 74182

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