Chapter 10
Digital Electronics

One mark questions (Knowledge)

1. What is a logic gate?
2. Mention any one basic logic gate.
3. Name any one combinational logic gate.
4. What is an XOR gate?
5. Write the output Boolean expression for the two input XOR gate.
6. Write the truth table of two inputs XOR gate.
7. Write the Boolean expression for the output of XNOR gate.
8. Define an XNOR gate.
9. Write the truth table of XNOR gate.
10. What is a NAND gate?
11. What is a NOR gate?
12. Name the two input logic gate whose output is “HIGH” only when it’s both the inputs are HIGH, otherwise the output will stay LOW.
13. Name the two input logic gate whose output is “HIGH” only when its two inputs are different.
14. Name the two input logic gate whose output is “HIGH” only when its two inputs are identical.
15. Define universal gate.
16. What is the speciality of NAND and NOR gate?
17. What are digital codes?
18. What is meant by BCD code?
19. What is a gray code?
20. What are weighted codes?
21. What are non-weighted codes?
22. Name any one non-weighted code?
23. What is a self-complementing code?
24. What are canonical forms of Boolean expressions?
25. What is a canonical SOP expression?
26. What is a canonical POS expression?
27. What is Karnaugh map?
28. What is meant by looping related to K-map?
29. What is meant by overlapping group in K-map?
30. What is redundant group in K-map?
31. What are don’t care conditions?
32. Define a Pair in K-map.
33. Define a Quad in K-map.
34. Define an Octet in K-map.
35. Define combinational logic circuit.
36. What is a sequential logic circuit?
37. What is a latch?
38. What is a flip flop?
39. Define a clock pulse.

40. What is a register?
41. Expand SISO related to shift register.
42. Expand SIPO related to shift register.
43. Expand PISO related to shift register.
44. Expand PIPO related to shift register.
45. What is a binary counter?
46. What does the term “asynchronous” mean in relation to binary counter?
47. What is an alphanumeric code?
48. What is the binary equivalent of the gray code 1011?
49. What is the gray code equivalent of the binary number 1011?
50. Expand ASCII.
51. Expand EBCDIC.
52. What is a half adder?
53. What is a full adder?
54. What is a half subtractor?
55. Write the Boolean expression for the sum of half adder.
56. Write the Boolean expression for the sum of full adder.
57. Write the Boolean expression for the carry of half adder.
58. Write the Boolean expression for the carry of full adder.
59. Write the Boolean expression for the difference of half subtractor.
60. Write the Boolean expression for the carry of the half subtractor.
61. Define minterm.
62. Define maxterm.
63. What is a SOP expression?
64. What is a POS expression?
65. What do you understand by the term “canonical form”?

One mark questions (understanding)

1. If A and B are the inputs of XOR-gate, write its output Boolean expression.
2. Why NAND and NOR gates are called universal gates?
3. How many two input NAND gates must be used to produce two input OR function?
4. How many two input NOR gates must be used to realize two input OR function?
5. Why do we use digital codes?
6. Give an example for weighted codes?
7. Give an example for a self-complimenting code.
8. Give an example for alphanumeric code.
9. Which digital code is also called as uni-distance code?
10. Why the gray code is also called as uni-distance code?
11. Expand SOP.
12. Expand POS.
13. How many cells an n variable K-map can have?
14. How many variables are eliminated from a pair?
15. How many variables are eliminated by a quad?
16. How many variables are eliminated by an octet?

17. How is D flip flop constructed from RS flip flop?
18. How is T flip flop constructed from JK flip flop?
19. Which is the line used to transfer data in and out of a PISO shift register?

One mark questions (skill)

1. Draw the symbol of XOR gate.
2. Draw the symbol of XNOR gate.
3. Realize OR gate using NAND gate.
4. Realize AND gate using NOR gate.
5. Convert 1001(Gray) to binary.
6. Convert 1001(2) to gray code.
7. Convert the decimal number 29 to BCD.
8. Write the decimal number 101 in BCD.
9. Write the BCD equivalent of the decimal number 123.
10. Draw the block diagram of half adder.
11. Draw the block diagram of full adder.
12. Draw the block diagram of half subtractor.

Two mark questions (Knowledge)

1. Realize XOR gate using basic gates.
2. What is an XOR gate? Write its truth table.
3. What is an XNOR gate? Write its truth table.
4. Realize XNOR gate using basic gates.
5. What are universal gates? Why they called so?
6. Realize XNOR gate using only NOR gates.
7. Realize XOR gate using NAND gates.
8. Name the universal logic gates.
9. What is an excess-3 code?
10. What do you understand by self-complementing code? Give examples.
11. Realize a half adder using XOR and AND gates.
12. Realize a half adder using only NAND gates.
13. Write the Boolean expression for the sum and carry of a full-adder.
14. Realize a half subtractor using XOR, NOT and AND gates.
15. Realize a half subtractor using NAND gates.
16. Write the Boolean expression for the difference and barrow of a half-subtractor.
17. Define Product term and Sum term.
18. What do you understand by ‘don’t care’ condition? How it is useful in K-map simplification?
19. What is a Pair? How many variables can be eliminated by a Pair in the K- map?
20. What is a Quad? How many variables can be eliminated by a quad in the K-map?
21. What is an octet? How many variables can be eliminated by an octet in the K-map?
22. What do you mean by alphanumeric codes? For what they are used?
23. What is race around condition? How can it be overcome?
24. Draw the logic circuit of a basic NAND latch.

25. Draw the logic circuit of un-clocked SR flip flop using NAND gates.
26. Draw the logic circuit of a D flip flop using NAND gates.
27. Draw the logic circuit of a JK flip flop using NAND gates.
28. Draw the logic circuit of JK master-slave flip-flop.
29. Mention the applications of flip-flops.
30. Mention the four types of registers.
31. Mention the applications of registers.
32. Draw the logic diagram of a 4-bit SISO shift register.
33. Draw the logic diagram of a 4-bit SIPO shift register.
34. Draw the logic diagram of a 4-bit PIPO shift register.
35. List the types of registers.
36. Write down the various modes of operation of shift register.

Two mark questions (Understanding)

1. Distinguish between excess-3 and BCD codes.
2. What do you understand by self-complementing code? Give examples.
3. Distinguish between weighted codes and non-weighted codes.
4. Write the difference between sum of product (SOP) and product of sum (POS).
5. Briefly explain the property rolling of K-map?
6. Explain the necessity of eliminating redundant groups in a K-map.
7. Distinguish between combinational and sequential logic circuits.
8. Compare asynchronous and synchronous counters.

Two mark questions (Skill)

1. Draw the pin diagram of IC 7400.
2. Draw the pin diagram of IC 7402.
3. Show how a two input OR-gate can be constructed from only NAND-gates.
4. Convert the gray code 1001 into binary using XOR gates.
5. Convert $456_{(10)}$ to BCD code.
6. Convert decimal 786 into 8421 code.
7. Write the applications of gray code?
8. Draw the block diagram of a full adder using two half adders and one OR gate.
9. Draw the truth table of a full adder.
10. Convert AB + $\bar{B}$ into canonical SOP expression.
11. Convert (A+B) (B+$\bar{A}$) into canonical POS form expression.
12. Write the decimal number 25 in BCD and exces-3 code.

Three mark questions (Knowledge)

1. Realize AND, OR and NOT gates using NOR gate only.
2. Realize AND, OR and NOT gates using NAND gate only.
3. What is half-adder? Draw the logic diagram and truth table of half adder.
4. What is half-subtractor? Draw the logic diagram and truth table of half subtractor.

5. What are self-complementing codes? Explain with a numerical example.
6. Mention the steps to be followed to convert SOP form of expression into canonical SOP expression.
7. Mention the steps to be followed to convert POS form of expression into canonical POS expression.
8. What is meant by don't care condition in K-map method? Explain it in brief.
9. What is a clock? State its use.
10. Mention a few applications of flip flops.

Three mark questions (Understanding)

1. Compare sequential and combinational logic circuits.
2. Distinguish between latch and flip-flop.
3. Explain the race-around condition in a JK flip-flop and how can it be eliminated?
4. With a logic circuit and truth table explain the working of D-flip-flop.
5. With a logic circuit and truth table explain the working of T-flip-flop.

Three mark questions (Skill)

1. Draw the logic circuits for the realization of basic logic operations using NAND gate only.
2. Convert the Boolean expression A.B + B.C + A.C into its canonical SOP form expression.
3. Convert the Boolean expression (A+B).(B+C).(A+C) into its canonical POS form expression.
4. Convert the logical function of three variables F(A,B,C)= A+B.C to standard SOP expression.
5. Convert $(1001)_2$ into equivalent gray code using XOR-gates.
6. Convert $(1001)_{Gray}$ into equivalent binary using XOR-gates.
7. Find the excess-3 code of $(786)_{10}$.
8. Convert the decimal number 789 into excess-3 code.
9. Write the excess-3 equivalent the decimal number 102.
10. Draw the logic circuit of a four bit PISO shift register.

Five mark questions (Knowledge)

1. What is a NAND gate? Realize AND, OR, NOT and XNOR gates using NOR gates
2. What is a NOR gate? Realize AND, OR, NOT and XOR gates using NAND gates.
3. What is a full-adder? Draw the diagram of full-adder using two half adders and an OR-gate. Write the truth table of full-adder.
4. Write steps involved in the simplification of Boolean equation using K-map technique.

Five mark questions (Understanding)

1. With a logic circuit and truth table explain the working of clocked SR flip-flop.
2. With a logic circuit and truth table explain the working of JK flip-flop.
3. With a relevant diagram explain the working of serial-in-serial-out (SISO) shift register.
4. With a relevant diagram explain the working of 4-bit synchronous up counter.
5. Give a comparison table of synchronous and asynchronous counters.

Problems

1. Simplify the Boolean expression Y= ∑m (0, 2, 4, 8, 10) +∑d (12, 14) using K-map. Draw the NAND gate equivalent circuit to realize the simplified expression.
2. Simplify the Boolean expression Y= ∑m (4, 5, 7, 9, 11, 12, 13, 15) +∑d (1, 3, 8) using K-map. Draw the NAND gate equivalent circuit to realize the simplified expression.
3. Simplify the Boolean expression Y= ∑m (0, 2, 6, 8, 10, 12, 14) +∑d (4, 9, 13) using K-map. Draw the NAND gate equivalent circuit to realize the simplified expression.
4. Simplify the Boolean expression Y= ∑m (1, 3, 5, 6, 8, 9, 11, 12) +∑d (0, 7, 14) using K-map.
5. Simplify the Boolean expression Y= ∑m(0,2,4,6,8,10,11,12,14,15) +∑d(9,13) using K-map.
6. Simplify using K-map, Y(A,B,C,D)=∑m(0,1,4,13,15) + ∑d(2,5,7).
7. Simplify the Boolean expression Y(A,B,C,D)=∑m(1,2,3,5,6,7,12)) using K-map. Also draw the logic circuit for the simplified expression using basic gates.