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S.K.S.S ARTS COLLEGE, THIRUPPANANDAL - 612504

QUESTION BANK

Title of the Paper

DIGITAL COMPUTER FUNDAMENTALS

Course: III BCA

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CORE COURSE VII

DIGITAL COMPUTER FUNDAMENTALS

Unit I

Number Systems and Codes: Binary Number System – Binary to Decimal Conversion – Decimal to Binary Conversion – Binary Addition – Binary Subtraction – Binary Multiplication and Division – Octal Numbers – Hexadecimal Numbers – Binary Codes – Error Detecting Codes – Error Correcting Codes.

Unit II

Logic Gates and Circuits: Boolean Algebra and Logic Gates – AND, OR, NOT, NAND, NOR, Exclusive OR and Exclusive OR Gates – Applications of XOR Gate – The Exclusive NOR Gate – Positive and Negative Logic – Logic Chararcteristics – Bipolar Logic Families – Integrated Circuits – Boolean Algebra: Definitions – Fundamentals of Boolean Algebra – Boolean Functions – Minterms and Maxterms – Laws and Theorems of Boolean Algebra – DeMorgan's Theorem – Universal Building Blocks (UBB) – NAND Gate as UBB – NOR Gate as UBB.

Unit III

Boolean Algebra: Simplifying Logic Circuits – Sum of Products – AND-OR Networks – Sum of Products and Product of Sums Forms – Karnaugh Maps – Product of Sums Simplification – NAND and NOR Implementation – AND-OR-INVERT Implementation – OR-AND-INVERT Implementation – Don't Care Conditions – Overlapping Groups – Rolling the Map – Eliminating Redundant Groups.

Unit IV

Combinational Logic Circuits: Introduction – Adders – The Half Adder – The Full Adder – Subtractors – BCD Adder – Multiplexers – Demultiplexers – Decoders – Encoders – Floating Point Number System – Range of Stored Numbers.

Unit V

Sequential Logic Circuits: Flip Flops – RS Flip Flop – Clocked RS Flip Flop – D Flip Flop – JK Flip Flop – T Flip Flop – Triggering of Flip Flops – Master Slave Flip Flop – Conversion of D Flip Flop – Conversion of T Flip Flop – Transfer Circuit – Clock – Counters and Shift Registers: Counters – Asynchronous or Ripple Counter – Ring Counter – Twisted Ring Counter – State Diagrams and State Tables – Magnitude Comparator – Programmable Arrays of Logic Cells – Shift Registers.

UNIT – I
Choose the Correct Answer

1. The value of radix in binary number system is _____
   a) 2
   b) 8
   c) 10
   d) 1

2. The binary equivalent of the decimal number 10 is _____
   a) 0010
   b) 10
   c) 1010
   d) 010

3. A computer language that is written in binary codes only is _____
   a) machine language
   b) C
   c) C#
   d) pascal

4. The octal equivalent of 1100101.001010 is _____
   a) 624.12
   b) 145.12
   c) 154.12
   d) 145.21

5. The input hexadecimal representation of 1110 is _____
   a) 0111
   b) E
   c) 15
   d) 14

6. A bit in a computer terminology means either 0 or 1.
   a) True
   b) False

7. Convert the binary equivalent 10101 to its decimal equivalent.
   a) 21
   b) 12
   c) 22
   d) 31

8. Which of the following is not a binary number?
   a) 1111
   b) 101

c) 11E
d) 000

9. Which of the following is the correct representation of a binary number?
   a) $(124)_2$
   b) 1110
   c) $(110)^2$
   d) $(000)_2$

10. What does the symbol D represent in a hexadecimal number system?
    a) 8
    b) 16
    c) 13
    d) 14

Answers: 1.a 2. c 3. a 4. b 5. b 6. a 7. a 8. c 9.d 10. c

Short Questions (2 Marks)

11. What is binary number system?
12. Why the hexadecimal number system is called as alphanumeric system?
13. Convert the decimal 41 to binary.
14. What do you mean by the decimal number system?
15. How will you convert a binary number to the decimal form?
16. Explain the hexadecimal number system?
17. What is binary coded decimal?
18. What is excess-3 code?
19. What is Gray code?
20. What is the octal number system?

Paragraph Questions (5 Marks)

21. Write a short notes on an octal and hexa decimal number system.
22. Convert the following binary numbers, to equivalent decimal numbers. i) 1011.010 ii) 11001
23. Explain error detecting codes.
24. Explain error correcting codes.
25. What are the number systems in Computer?
26. Convert the following decimal values to binary? a. 58 b. 2032 c.5096 d. 123.750
27. Convert the following octal numbers to decimal? a. 743 b. 365 c.3777 d. 1204
28. Convert the following decimal values to octal. a. 59 b. 65536 c. 819 d. 76524
29. Convert the following hexa values to decimal. a. 92 b. 2C1 c. 37FD d. 1B9
30. Convert the following decimal values to hexa. a. 4095 b. 25619 c. 65760 d. 314

Essay Type Questions (10 Marks)

31. Describe in detail error detecting and error correcting codes. Bring out their advantages and disadvantages as error detectors.

32. Convert: a. $(127.4)_8$ b.$(B65F)_{16}$ and c. $(110101.11)_2$ to decimal numbers.
33. Perform the following in binary form.
    (a) (128)10 - (64)10 (b) (l02)10 + (120)10 (c) (31)10 X (14)10 (d) (25)10 / (5)10
34. Describe about alphanumeric codes and error codes.
35. Solve the following Binary numbers into its equivalent Octal and Hexadecimal Numbers:
    (a) (101011)2 (b) (11011110)2
36. What is the feature of gray code? What are its applications?
37. Explain binary addition and subtraction with an example.
38. Find the decimal equivalent of the following binary numbers :
    a. 1101011 b.11010 c.10110011 d.11011101 e.1110101 f.1000 g.10110001100 110.
39. Find the octal equivalent of the following binary numbers :
    a. 1101011 b.11010 c.10110011 d.11011101 e.1110101 f.1000 g.10110001100
40. Find the Hexadecimal equivalent of the following binary numbers :
    a. 1101011 b.11010 c.10110011 d.11011101 e.1110101 f.1000 g.10110001100

UNIT - II

Choose the Correct Answer

1. In boolean algebra, the OR operation is performed by which properties?
   a) Associative properties
   b) Commutative properties
   c) Distributive properties
   d) All of the Mentioned

2. The expression for Absorption law is given by _____
   a) A + AB = A
   b) A + AB = B
   c) AB + AA' = A
   d) A + B = B + A

3. According to boolean law: A + 1 = ?
   a) 1
   b) A
   c) 0
   d) A'

4. A(A + B) = ?
   a) AB
   b) 1
   c) (1 + AB)
   d) A

5. DeMorgan's theorem states that _____
   a) (AB)' = A' + B'
   b) (A + B)' = A' * B
   c) A' + B' = A'B'
   d) (AB)' = A' + B

6. (A + B)(A' * B') = ?
   a) 1
   b) 0
   c) AB
   d) AB'

7. Complement of the expression A'B + CD' is _____
   a) (A' + B)(C' + D)
   b) (A + B')(C' + D)
   c) (A' + B)(C' + D)
   d) (A + B')(C + D')

8. Simplify Y = AB' + (A' + B)C.
   a) AB' + C
   b) AB + AC
   c) A'B + AC'
   d) AB + A

9. The boolean function A + BC is a reduced form of _____
   a) AB + BC
   b) (A + B)(A + C)
   c) A'B + AB'C
   d) (A + C)B

10. There are 5 universal gates.
    a) True
    b) False

Answers: 1. d 2. a 3. a 4. d 5. a 6. b 7.b 8. a 9. b 10. b

Short Questions (2 Marks)

11. Define a Gate.
12. State De Morgan's theorem.
13. Classify the logic family by operation?
14. Mention the classification of saturated bipolar logic families.
15. What are basic properties of Boolean algebra?
16. State the commutative property of Boolean algebra.
17. Define duality property.
18. How do you find minterm and maxterm
19. How many universal gates are there?
20. What are universal logic gates?

Paragraph Questions (5 Marks)

21. Explain the basic theorems of Boolean Algebra..
22. Explain logic gates with an example.
23. Reduce A'B'C' + A'BC' + A'BC.
24. Describe OR gate in detail with construction & working ?

25. Explain AND gate in detail with construction & working?
26. Explain NOT gate in detail with construction & working?
27. Explain NOR gate?
28. Describe NAND gate?
29. Write short note on X-OR gate?
30. Write short note on EX-NOR gate?

Essay Type Questions (10 Marks)

31. Explain the universality of NAND and NOR gates.
32. .Explain the binary logic with symbols and truth tables.
33. Write the truth table of an OR gate and explain its behavior. Realise an OR gate using NAND gates only.
34. Find the complement of the functions F1 = x'yz' + x'y'z and F2 = x (y'z' + yz). By applying De-Morgan's theorem.
35. State and prove the two basic De Morgan's theorems.
36. Explain the universal logic gates with truth table.
37. Draw the logic F = x' y' z + x 'y z + xy' circuit for the expression.
38. Reduce the following Boolean expressions into its minimal form :
    (a) W(K,L,M)=KL+LM+KM (b) Z(A,B,C,D,E,F)=A +AB +ABC+ABCD + ABCDE + ABCDEF.
39. Discuss about Minterms and maxterms with example.
40. Explain positive and negative logic with neat diagram and truth table..

UNIT –III

Choose the Correct Answer

1. The logical sum of two or more logical product terms is called _____
   a) SOP
   b) POS
   c) OR operation
   d) NAND operation

2. The expression Y=AB+BC+AC shows the _____ operation.
   a) EX-OR
   b) SOP
   c) POS
   d) NOR

3. The expression Y=(A+B)(B+C)(C+A) shows the _____ operation.
   a) AND
   b) POS
   c) SOP
   d) NAND

4. A product term containing all K variables of the function in either complemented or uncomplemented form is called a _____
   a) Minterm
   b) Maxterm

c) Midterm
d) ∑ term

5. canonical sum of product form of the function y(A,B) = A + B is _____
   a) AB + BB + A'A
   b) AB + AB' + A'B
   c) BA + BA' + A'B'
   d) AB' + A'B + A'B'

6. Maxterm is the sum of _____ of the corresponding Minterm with its literal complemented.
   a) Terms
   b) Words
   c) Numbers
   d) Nibble

7. Canonical form is a unique way of representing _____
   a) SOP
   b) Minterm
   c) Boolean Expressions
   d) POS

8. There are _____ Minterms for 3 variables (a, b, c).
   a) 0
   b) 2
   c) 8
   d) 1

9. A Karnaugh map (K-map) is an abstract form of _____ diagram organized as a matrix of squares.
   a) Venn Diagram
   b) Cycle Diagram
   c) Block diagram
   d) Triangular Diagram

10. There are _____ cells in a 4-variable K-map.
    a) 12
    b) 16
    c) 18
    d) 8

Answers: 1. a 2. b 3. b 4. a 5. b 6. a 7. c 8. c 9. a 10. b

Short Questions (2 Marks)

11. What is meant by Karnaugh map?
12. What is sop and pos?
13. State the limitations of karnaugh map.
14. What are the don't care condition?

15. Simplify the following expression Y = (A + B) (A + C') (B' + C')
16. Write the maxterms corresponding to the logical expression
17. What is a prime implicant?
18. What is redundancy Theorem?
19. What is the law of Boolean algebra?
20. What are the two forms of Boolean expression?

Paragraph Questions (5 Marks)

21. Explain the universal logic gates with truth table.
22. Express the following functions in canonical SOP form Y = A +BC
23. Construct NOT, AND, OR gates using NAND gate.
24. Construct NOT, OR, AND gate using NOR gate.
25. Explain applications of Ex-OR gate in detail.
26. Construct logic circuit diagram for half adder using only NAND gate.
27. Construct logic circuit diagram for half adder using only NOR gate.
28. Why are combinational circuits more frequently constructed with NAND and NOR gate than with AND,OR and NOT gates ?
29. Construct a logic circuit diagram for the exclusive OR function using only NOR gates.
30. Construct a logic circuit diagram for the exclusive AND function using only NAND gates.

Essay Type Questions (10 Marks)

31. Simplify the expression y= $\sum_m$(3,4,5,7,9,13,14,15) using the K-map method.
32. Minimize four variables Boolean equation using K-map method and implement it using NAND gates.
    F = WXYZ + WXYZ + WXYZ + WXYZ
33. Using maps derive minimal product of sums expression for the function in four variables w, x, y, z:
    m1+m3+m5+m7+m12+m13+m8+m9.
34. A combination circuit gives an output 1 if there are exactly two ones in the input. Using a Karnaugh map design the circuit.
35. Explain sum of products and product of sums in detail.
36. Discuss about implementation of NAND and NOR gates.
37. Explain about AND-OR-INVERT implementation.
38. Write a detailed notes on rolling the map.
39. Explain in details about AND-OR Networks with neat diagram.
40. Discuss about OR-AND-INVERT implementation.

UNIT – IV

Choose the Correct Answer

1. Total number of inputs in a half adder is _____
   a) 2
   b) 3

c) 4
d) 1

2. The difference between half adder and full adder is _____
   a) Half adder has two inputs while full adder has four inputs
   b) Half adder has one output while full adder has two outputs
   c) Half adder has two inputs while full adder has three inputs
   d) All of the Mentioned

3. How many AND, OR and EXOR gates are required for the configuration of full adder?
   a) 1, 2, 2
   b) 2, 1, 2
   c) 3, 1, 2
   d) 4, 0, 1

4. Half subtractor is used to perform subtraction of _____
   a) 2 bits
   b) 3 bits
   c) 4 bits
   d) 5 bits

5. How many outputs are required for the implementation of a subtractor?
   a) 1
   b) 2
   c) 3
   d) 4

6. What is a multiplexer?
   a) It is a type of decoder which decodes several inputs and gives one output
   b) A multiplexer is a device which converts many signals into one
   c) It takes one input and results into many output
   d) It is a type of encoder which decodes several inputs and gives one output

7. The word demultiplex means _____
   a) One into many
   b) Many into one
   c) Distributor
   d) One into many as well as Distributor

8. How many inputs will a decimal-to-BCD encoder have?
   a) 4
   b) 8
   c) 10
   d) 16

9. How many outputs will a decimal-to-BCD encoder have?
   a) 4
   b) 8
   c) 12

d) 16

10. How many OR gates are required for a Decimal-to-bcd encoder?
    a) 2
    b) 10
    c) 3
    d) 4

Answers: 1. a 2. c 3. b 4. a 5.b 6. b 7. d 8. c 9. a 10. d

Short Questions (2 Marks)

11. What is binary decoder.
12. Define combinational logic.
13. Write the design procedure for combinational circuits.
14. Define half adder and full adder.
15. Define Decoder.
16. Define Encoder
17. What is priority Encoder?
18. Define multiplexer.
19. What do you mean by comparator?
20. Give the definition of 4 to 1 line multiplexer.

Paragraph Questions (5 Marks)

21. Describe the working of half adder with neat circuit.
22. Describe the range of stored numbers.
23. Explain a 1 * 16 bit multiplexer with truth table.
24. Describe the use of encoders.
25. What are Demultiplexers?
26. What is a decoder? Draw the logic diagrams of a BCD to decimal decoder and explain.
27. Using a suitable multiplexer design a circuit to give X (A, B, C, D) = Y- 0, 2, 3, 5, 7, 8, 9, 12,15.
28. Explain 3-8 Decoder or Binary to Octal decoder.
29. Describe advantages and disadvantages of multiplexer and demultiplexer.
30. Explain with block diagram 2 – 1 line multiplexer .

Essay Type Questions (10 Marks)

31. Explain the design of decoders with diagram.
32. What is a decoder? Draw the logic diagrams of a BCD to decimal decoder and explain.
33. Explain the operation of digital multiplexers and show how it can be used to implement any Boolean function.
34. Using a suitable multiplexer design a circuit to give X (A, B, C, D) = Y- 0, 2, 3, 5, 7, 8, 9, 12,15.
35. Draw the logic diagram of full subtractor and explain its operation.
36. Explain about floating point number system.
37. Design the logic diagram of adder and subtractor with truth table.
38. Explain with a logic diagram, the working of a full-adder.
39. Explain the action of multiplexer and demultiplexer with suitable diagrams.

40. Sketch the circuit of a half subtractor. Show how a full subtractor is built using half subtractors.

UNIT – V

Choose the Correct Answer

1. One example of the use of an S-R flip-flop is _____
   a) Transition pulse generator
   b) Racer
   c) Switch debouncer
   d) Astable oscillator

2. The truth table for an S-R flip-flop has how many VALID entries?
   a) 1
   b) 2
   c) 3
   d) 4

3. When both inputs of a J-K flip-flop cycle, the output will _____
   a) Be invalid
   b) Change
   c) Not change
   d) Toggle

4. Which of the following is correct for a gated D-type flip-flop?
   a) The Q output is either SET or RESET as soon as the D input goes HIGH or LOW
   b) The output complement follows the input when enabled
   c) Only one of the inputs can be HIGH at a time
   d) The output toggles if one of the inputs is held HIGH

5. The characteristic of J-K flip-flop is similar to _____
   a) S-R flip-flop
   b) D flip-flop
   c) T flip-flop
   d) Gated T flip-flop

6. A J-K flip-flop can be obtained from the clocked S-R flip-flop by augmenting _____
   a) Two AND gates
   b) Two NAND gates
   c) Two NOT gates
   d) Two OR gates

7. How is a J-K flip-flop made to toggle?
   a) J = 0, K = 0
   b) J = 1, K = 0
   c) J = 0, K = 1
   d) J = 1, K = 1

8. Master slave flip flop is also referred to as?
   a) Level triggered flip flop
   b) Pulse triggered flip flop
   c) Edge triggered flip flop
   d) Edge-Level triggered flip flop

9. In digital logic, a counter is a device which _____
   a) Counts the number of outputs
   b) Stores the number of times a particular event or process has occurred
   c) Stores the number of times a clock pulse rises and falls
   d) Counts the number of inputs

10. A counter circuit is usually constructed of _____
    a) A number of latches connected in cascade form
    b) A number of NAND gates connected in cascade form
    c) A number of flip-flops connected in cascade
    d) A number of NOR gates connected in cascade form

Answers: 1. c 2. c 3. c 4. a 5. a 6. a 7. d 8. b 9. b 10. c

Short Questions (2 Marks)

11. What are the classifications of sequential circuits?
12. What do you mean by Flip Flop?.
13. Define shift register.
14. What are the different types of flip-flop?
15. What is the operation of RS flip-flop?
16. What is the operation of D flip-flop?
17. What is the operation of JK flip-flop?
18. Define race around condition.
19. Give the comparison between synchronous & Asynchronous counters.
20. What is the operation of T flip-flop?

Paragraph Questions (5 Marks)

21. Discuss the working of ring counter with neat circuit.
22. Explain about the working of S-R flip flop using NAND gate .
23. Explain about the working of T-flip flop .
24. Explain about the working of J-K flip flop.
25. Explain about the working of Edge triggered J-K flip flop.
26. What are the advantages and applications of shift register.
27. Describe about Transfer Circuit.
28. Explain about about Twisted ring counter.
29. What is the advantage of a synchronous counter over ripple counter?
30. Write short notes on Programmable Arrays of Logic cells.

Essay Type Questions (10 Marks)

31. Explain the principles of master slave flip flop using logic circuit.
32. Draw the diagram of D flip-flop and explain its function.
33. Explain about the major types of flip flops.
34. Explain in detail about major types of counters.
35. Describe about the conversion of D and T flip flops.
36. Explain the working principles of shit registers.
37. Describe the design of the synchronous counter and explain with truth table.
38. What is a status register? What are its uses? How is a status register designed?
39. Explain in detail about the State diagrams and State tables.
40. Draw the block diagram of a ripple counter. Explain its operation.