

Question bank Oct. 2019

Class: FYBSc Sem- I

Subject: Electronic Science [ELE1102]

Paper: II

Name: Logic Gates & Arithmetic Circuits

Answer in short (1 Marks)

- 1) Name different number systems with their base.
- 2) What is radix used in various number systems?
- 3) Write full form of ASCII and BCD code.
- 4) What do you mean by weighted code?
- 5) What is excess 3code?
- 6) What is alpha numerical code?
- 7) What is gray Code?
- 8) Give the symbols for NAND and NOR gate.
- 9) What do you mean by positive logic?
- 10) Convert the following in its 2's compliment form- 1101.
- 11) Define 1's compliment.
- 12) What is half adder?
- 13) What do you mean by full adder?
- 14) Define the term parity.
- 15) Define the term number systems.

Answer in short (2 Marks)

- 1) Distinguish between binary and BCD code.
- 2) Name weighted and unweighted code.
- 3) What are the basic gates?
- 4) Define the following term- i) logic gate ii) Truth Table.
- 5) What is difference between odd parity and even parity.
- 6) Names the derived gates with their symbol.
- 7) Design OR gates using only NAND gates.
- 8) Construct AND gate using only NOR gates.
- 9) What are advantages of K-map?
- 10) Why OR gate is called as OR?
- 11) Explain difference between OR and NOR gates.
- 12) Write ASCII code for letter A and Z.
- 13) What is difference between AND and NAND function?

- 14) Why NOT gate is called as NOT?
- 15) Write few lines about ALU.
- 16) States the rules for binary addition.
- 17) Convert the following in its 1's complement form- i) 10101 ii) 01011.
- 18) States the rules for binary subtraction.
- 19) What do you mean by 1's complement and 2's complement?
- 20) Determine SUM and CARRY for full adder- i) A = 1, B = 0, C = 0
ii) A = 0, B = 1, C = 1.
- 21) What are the applications of De-Morgan's theorems?
- 22) What is difference between decimal and binary?
- 23) Why NAND and NOR gates are called an universal gates?
- 24) Verify the following – i) $A \cdot A = A$ ii) $A + A = A$
- 25) Express the following numbers in excess 3 code- i) 74 ii) 93.

Long Answer (4 Marks)

- 1) Convert the following numbers in Gray code-i) $(0101)_2$ ii) $(1101)_2$
- 2) Solve the following-
 - i) $(76)_{10} = (\text{-----})_2$ ii) $(FF)_{16} = (\text{----})_{10}$
 - ii) $(110101)_2 = (\text{---})_{16}$ iv) $(01011)_2 = (\text{----})_{10}$
- 3) Explain the terms – a) Number systems b) Base
- 4) Write a short note on a) ASCII code b) BCD code.
- 5) Explain weighted and non weighted codes with simple example.
- 6) State various laws of Boolean algebra.
- 7) State and prove De-Morgan's theorems.
- 8) Verify the following Boolean laws i) $\overline{\overline{A}} = A$ ii) $A + 0 = A$.
- 9) Explain –i) pair ii) quad iii) octet.
- 10) Construct all basic gates using only NAND gate.
- 11) Design NOT, OR, and AND using only NOR gates.
- 12) Explain the following – i) Min. terms ii) Max. terms.
- 13) Simplify the following expression using K-map.-----

$$Y = \overline{A}\overline{B}\overline{C}\overline{D} + \overline{A}B\overline{C}\overline{D} + A\overline{B}\overline{C}\overline{D} + A\overline{B}C\overline{D} + ABC\overline{D} + ABCD + ABC\overline{D} + \overline{A}BC\overline{D}.$$
- 14) Minimise the following expression using Boolean Laws-

$$Y = ABC\overline{D} + ABC + BC$$
- 15) Simplify and draw logic diagram –

$$Y = \overline{A}\overline{B}\overline{C} + \overline{A}B\overline{C} + A\overline{B}\overline{C} + ABC.$$
- 16) Simplify K-map and write logic expression

	$\overline{C} \overline{D}$	$\overline{C} D$	$C D$	$C \overline{D}$
$\overline{A} \overline{B}$	0	0	1	0
$\overline{A} B$	1	1	1	1
$A B$	1	1	1	1
$A \overline{B}$	0	0	0	0

17) Minimise the following expression using K- map. Technique.

$$Y = \overline{A} B \overline{C} D + A B \overline{C} D + A B C \overline{D} + A \overline{B} C \overline{D}.$$

18) How EXOR can be used as parity checker?

19) Explain EXOR gate using symbol, logic diagram and truth table.

20) Do the following using 2's complement method – $(37)_{10} - (29)_{10}$

Verify using 1's complement method.

21) Draw and explain logic diagram of 3 bit universal adder/subtractor.

22) Convert the following binary numbers in its 2's complement form-

i) 10101 ii) 01011 iii) 11101 iv) 10110

23) Perform The following using 2's complement method $(12)_{10} - (7)_{10}$

Verify the result using direct method.

24) Draw the logic diagram of half subtractor and explain in brief.

25) What is difference between half and full subtractor?

26) Explain half adder and half subtractor.

27) Perform the following using 1's complement technique and verify.

$$(17)_{10} - (11)_{10}$$

28) Write a short note on universal adder subtractor.

29) Describe the function of full adder with its logic diagram and truth table

30) Explain the working of 4 bit parallel adder with logic diagram.

31) State the rule for binary addition. Explain with suitable example 4 bit binary adder.

32) Sketch and explain block diagram of computer.

33) Compare half adder with full adder.

34) Write note on various types of codes.

35) Simplify following using K-Map

	$\overline{C} \overline{D}$	$\overline{C} D$	$C D$	$C \overline{D}$
$\overline{A} \overline{B}$	0	1	0	0
$\overline{A} B$	1	1	0	0
$A B$	1	1	0	0
$A \overline{B}$	0	1	0	0

36) Verify following using Boolean laws a) $A+B=B+A$ b) $A.B= B.A$.

37) Explain laws of union and laws of intersection.

38) Explain difference between SOP type and POS type logic expression with simple example.

39) Draw logic diagram for $Y= AB+ BC+ AC$

40) Why NOT gate is called an inverter?

Long Answer (6 Marks)

- 1) What are the basic logic gates? Explain with Boolean expression, logic symbol and truth table.
- 2) Name the derived gates. Explain with their symbol, logic expression and truth table.
- 3) Convert - a) $(27.4)_{10} = (---)_2$ b) $(2AF.BD)_{16} = (----)_{10}$ c) $(101101.101)_2 = (---)_{16}$
- 4) Draw the logic diagram symbol and truth table for EX-OR gate. Why it is called EX-OR?
- 5) What is K-Map? What are advantages of K-map? Define pair, quad, and octet and explain their effect on minimisation of logic expression.
- 6) State at list 6 Boolean laws. Prove any two of them.
- 7) Draw logic symbol, Boolean expression and truth table for NAND, NOR, OR and EX-OR gates. What is difference between OR and EX-OR?
- 8) What is K-Map? Explain SOP and POS type expression. Write and explain format for two variables and three variables K-Map.
- 9) What are various number systems? Why binary number system is referred as weighted code? Explain with suitable example.
- 10) What is an adder? Explain action of full adder with example. How full adder is different from half adder?
- 11) Draw logic diagram of 4 bit universal adder and explain why it is called universal.

- 12) What are rule for binary subtraction? Do the following subtraction using 1's and 2's compliments technique $(25)_{10} - (13)_{10}$.
- 13) Explain 1's and 2's compliment form of binary numbers. Wright 1's and 2's compliment of 10101 Perform the following using 1's and 2's compliment- $(13)_{10} - (6)_{10}$
- 14) What is speciality of full adder circuit over half adder? Design full adder using half adder

Long Answer (12 Marks)

- 1) What is parity? Explain odd and even parity. Design parity checker using EX-OR gate.
- 2) What do you mean by logic? What are the basic and derived gates? Explain NAND and NOR in detail.
- 3) What are various number systems? Explain important of number systems with example.
- 4) What are various codes? Explain weighted codes. What is significance of non-weighted codes?
- 5) Explain basic gates with their symbols, truth table and logic expressions. Why NAND and NOR gates are called universal building blocks? Design OR gates using only NAND gates.
- 6) What is K-map? Where it is used? What are its advantages? Explain 4 variables K-map with suitable example.
- 7) What are rules for binary addition? Give the comparison of half adder and full adder. Explain 4 bit parallel adder.
- 8) What are rules for binary subtraction? Define 1's and 2's compliment technique for subtraction. Do the following using 1's compliment and verify the result using 2's compliment technique- $(17)_{10} - (14)_{10}$.
- 9) Draw logic symbol, expression and truth table for following logic gates –
i) NOT gate ii) OR gate iii) AND gate iv) NAND gate v) NOR gate vi) EX-OR gate
- 10) Explain need of number systems .Name the different number systems with their symbols and base. Convert i) $(31)_{10} = (---)_2$ ii) $(FD)_{16} = (---)_{10}$ iii) $(10101101)_2 = (---)_{16}$ iv) $(9B)_{16} = (---)_2$.

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