

Q.1 A. Select Correct Alternative and Rewrite the Sentences.**4 Marks**

- Which expression is the distributive law of Boolean algebra? _____
a) $A \cdot (B + C) = A \cdot B + A \cdot C$ b) $(A + B) + C = A + (B + C)$
c) $A \cdot (B \cdot C) = (A \cdot B) + C$ d) $A \cdot (B \cdot C) = (A \cdot B) \cdot (A \cdot C)$
- A gate gives the output as 1 only if all the inputs signals are 1.
a) AND b) OR c) Ex-OR d) NOR
- An OR gate can be imagined as _____.
a) switches connected in series b) switches connected in parallel
c) transistors connected in series d) transistors connected in parallel
- Convert $(22)_8$ from octal to its corresponding decimal equivalent _____.
a) 20 b) 18 c) 14 d) 81

B. Answer Any Two of The Following**6 Marks**

- How is a number in binary number system converted into its equivalent decimal system? Explain with example.
- Write in tabular form values of decimal numbers 0 to 30 and their equivalents in binary, Octal and Hexadecimal.
- Convert following binary to its octal and hexadecimal using shortcut technique
a. $(0110101110111111)_2$
b. $(11011010100010)_2$
c. $(0101101011010101010)_2$

Q.2 A. Answer Any Two of The Following.**6 Marks**

- Convert the given decimal numbers to its binary equivalents.
1) 11234 2) 458 3) 786
- State distributive law in Boolean algebra. Prove any of these laws using truth table.
- Explain 'base' of number systems with examples. What is the value of base of Binary, Octal, Decimal and hexadecimal number systems?

B. Answer Any One of The Following.**4 Marks**

- Convert the following hexadecimal to binary.
1. COFFEE 2. 6A7 3. 2BAD 4. BED
- Explain with definition, diagram and truth table the AND gate and NAND gate.

Q.3 A. Answer Any Two of The Following.**6 Marks**

- Convert the binary number $(100110)_2$ to its Hexadecimal, Decimal and Octal equivalent.
- Perform the following binary addition.
a. $(111010101010 + 11010000111 + 1010111011)_2$
b. $(1111 + 1001 + 1111 + 0011)_2$
c. $(10101 + 11001 + 01111)_2$
- Explain and prove the Idempotent Law in Boolean algebra.

B. Answer Any One of The Following.**4 Marks**

1. Convert the following decimal number to binary and perform binary addition:
 - a. $(54)_{10}$
 - b. $(243)_{10}$
 - c. $(1364)_{10}$
2. Define EX-OR logic and draw its logic diagram and write and prove its logical equation with help of truth table.

Q.4 A. Answer Any Two of The Following.**6 Marks**

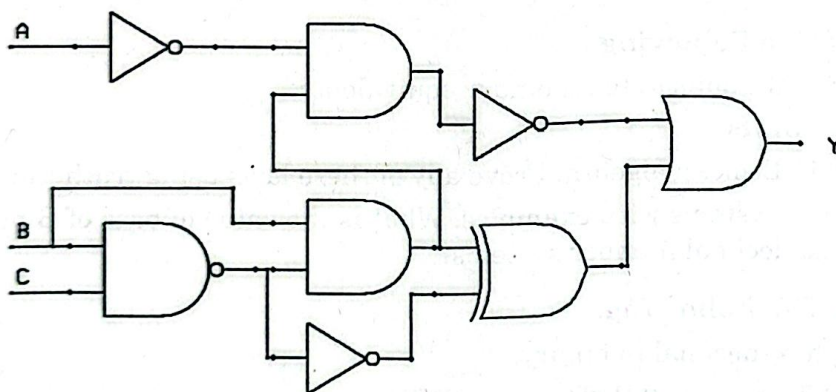
1. How is the dual of a Boolean expression obtained?
2. Convert the octal number $(352)_8$ into its binary equivalent and the binary number $(1010111100)_2$ into its Octal equivalent.
3. What are Universal gates? Give two examples.

B. Answer Any One of The Following.**4 Marks**

1. Add 3-digit max number in Hexadecimal with 2-digit Max number in Octal with 4-digit max Number in Binary. Express the sum in decimal.
2. Consider $(A) = 5A_{16}$, $(B) = C3_8$, show with working, the result of ANDing and EXORing operation on A and B.

Q. 5A. Answer Any Two of The Following.**10 Marks**

1. Explain the method of converting decimal number $(345)_{10}$ to its binary equivalent.
2. Subtract $(110110)_2$ from $(11101)_2$ using two's complement method.
3. Give the Boolean expression for the logic diagram given below. Name the gates used and also write its truth table.

**OR****B. Answer Any Two of The Following.****10 Marks**

1. Solve the following
 - a. $(10010)_2 = (?)_8 = (?)_{16} = (?)_{10}$
 - b. $(75)_8 = (?)_{10} = (?)_{16}$
2. Draw the logical circuit diagram to realize the logical expression shown below. Name the gates used and show the truth table.

$$F = (A + B + C) * (A' + B' + C) * (A + B' + C)$$
3. State De Morgan's theorems and prove using truth table.