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| **SESSION** | **SEPT 2024** |
| **PROGRAM** | **BACHELOR OF COMPUTER APPLICATIONS (BCA)** |
| **SEMESTER** | **II** |
| **COURSE CODE & NAME** | **DCA1205 DIGITAL LOGIC** |
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**Set-I**

**1. Distinguish between Half Adders and Full Adders.**

**Ans 1.**

**Distinguish Between Half Adders and Full Adders**

In digital logic and computer systems, adders are essential circuits used to perform arithmetic operations, particularly addition. Two primary types of adders are **Half Adders** and **Full Adders**. While both play a crucial role in the arithmetic computations of digital systems, they differ significantly in terms of structure, functionality, and application. Here is an in-depth comparison of the two:

**1. Definition and Basic Structure**

A **Half Adder** is a combinational circuit designed to add two single-bit binary numbers. It has

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**2. List and explain different types of Flip-Flops .**

**Ans 2.**

**Different Types of Flip-Flops**

Flip-flops are fundamental building blocks of digital electronics, used to store and control binary data. They are bistable devices, meaning they have two stable states (0 and 1), and they are primarily used in sequential circuits such as registers, counters, and memory elements. Flip-flops operate based on clock signals and can change states based on the input and timing. There are several types of flip-flops, each serving specific purposes in digital systems. Below is a detailed explanation of the types:

**1. SR Flip-Flop (Set-Reset Flip-Flop)**

The **SR Flip-Flop** is the simplest type of flip-flop with two inputs: **Set (S)** and **Reset (R)**. It has

**3. Simplify the following Boolean function, f(W,X,Y,Z)=∑m(2,6,8,9,10,11,14,15) using Quine-McClukey tabular method.**

**Ans 3.**

To simplify the Boolean function $f\left(W,X,Y,Z\right)=∑m\left(2,6,8,9,10,11,14,15\right)$ using the **Quine-McCluskey Tabular Method**, follow these steps:

**Step 1: Write the Binary Representation of Min-terms**

Write the binary representation of each min-term in the function. Include the number of 1's in each binary representation.

| Min-term | Binary Representation | Number of 1's |
| --- | --- | --- |
| 2 | 0010 | 1 |
| 6 | 0110 | 2 |
| 8 | 1000 | 1 |
| 9 | 1001 | 2 |
| 10 | 1010 | 2 |
| 11 | 1011 | 3 |
| 14 | 1110 | 3 |
| 15 | 1111 | 4 |

**Set-II**

**4. Explain the working of Johnson Counter with appropriate truth table.**

**Ans 4.**

**Working of Johnson Counter**

A **Johnson Counter**, also known as a twisted ring counter, is a type of shift register counter where the inverted output of the last flip-flop is fed back as the input to the first flip-flop. It operates in a sequence of states that are repeated cyclically, making it efficient for applications like frequency division, timing circuits, and pattern generation.

**Structure**

A Johnson Counter consists of:

1. **n Flip-Flops** connected in series.

**5. Explain the working principle of a Digital-to-Analog Converter (DAC).**

**Ans 5.**

**Working Principle of a Digital-to-Analog Converter (DAC)**

A **Digital-to-Analog Converter (DAC)** is an electronic device that converts digital signals, represented by binary numbers, into analog signals, such as voltage or current. This conversion is essential in applications like audio processing, video displays, and communication systems, where digital information needs to be rendered in a form perceivable by humans or compatible with analog systems.

**Representation of Digital Input**

The digital input to a DAC is typically a binary number that corresponds to discrete levels of the

**6. Write a short note on MODEM.**

**Ans 6.**

A MODEM, short for Modulator-Demodulator, is an essential device in telecommunications that facilitates data transmission between digital devices and analog communication systems, such as telephone lines or radio waves. Its primary purpose is to convert digital signals generated by a computer or other digital devices into analog signals suitable for transmission over conventional analog communication channels. Similarly, it performs the reverse operation, converting