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| **SESSION** | **APRIL2025** |
| **PROGRAM** | **BACHELOR OF COMPUTER APPLICATIONS (BCA)** |
| **SEMESTER** | **1** |
| **COURSE CODE & NAME** | **DCA1108 FUNDAMENTALS OF COMPUTERS & DIGITAL SYSTEMS** |
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**Set – I**

**Q1. a. Differentiate between analog, digital, and hybrid computers with examples. 4**

**b. Explain the working principle of an optical scanner and list its applications. 3**

**c. Convert the decimal number 154 to:**

**Binary**

**Octal**

**Hexadecimal 3**

**Ans 1.**

**a. Analog, Digital, and Hybrid Computers**

**Analog Computers**

Analog computers operate on continuous data and are designed to process physical quantities such as temperature, pressure, and speed. These machines use mechanical or electrical energy to represent data in continuous form. For example, a mercury thermometer is a simple analog device that measures temperature with a continuous scale. In computing, early devices like the slide rule or devices used in scientific labs to simulate weather or physics models are analog in nature. They lack accuracy when compared to digital systems and are mainly used

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**Q2a. Explain the difference between primary memory and secondary memory with examples.**

**b. Simplify the Boolean expression using laws:**

**F = A(B + C) + A(B + C)'**

**Ans 2.**

**a. Difference Between Primary Memory and Secondary Memory**

**Primary Memory (Main Memory)**

Primary memory refers to the computer’s immediate internal memory that is directly accessible by the Central Processing Unit (CPU). It is used to temporarily store data and instructions that are currently being processed. This memory is volatile, meaning that all data is lost when the computer is powered off. The most common types of primary memory are RAM (Random Access Memory) and ROM (Read-Only Memory). RAM is read/write memory used for temporary storage during active processing. ROM, on the other hand,

**Q3.a. Describe the function of Control Unit and Arithmetic Logic Unit (ALU) in CPU. 5**

**b. Draw the logic circuit for: F = A' + BC.**

**Ans 3.**

**a. Functions of Control Unit and Arithmetic Logic Unit (ALU) in CPU**

**Control Unit (CU)**

The Control Unit is a crucial component of the Central Processing Unit (CPU). Its primary function is to manage and coordinate the operations of the computer. The CU acts like a supervisor, directing the flow of data between the CPU, memory, and input/output devices. It does not process or store data itself but ensures that all parts of the computer system work together smoothly and efficiently.

The CU interprets the instructions fetched from memory and translates them into control signals that activate other parts of the CPU, such as the ALU, memory registers, and buses. For example, if an instruction involves arithmetic computation, the CU signals the ALU to

**Set – II**

**Q4. a. Explain the working of a Half Subtractor and Full Subtractor with suitable circuit diagrams. 5**

**b. What are multiplexers and demultiplexers? Discuss any two applications of each. 5**

**Ans 4.**

**a. Working of Half Subtractor and Full Subtractor with Circuit Diagrams**

**Subtractors**

In digital electronics, subtractors are combinational logic circuits designed to perform binary subtraction. The two types of basic subtractors are the Half Subtractor and the Full Subtractor. These circuits help in determining the difference and borrow values during subtraction operations.

**Half Subtractor**

A Half Subtractor is a circuit that performs the subtraction of two single-bit binary numbers. It has two inputs, namely **A** (minuend) and **B** (subtrahend), and produces two outputs: the

**Q5.a. Define sequential circuits. How do flip-flops help in implementing them? 5**

**b. Draw circuit diagrams for D and T flip-flops. Mention their characteristic equations and applications. 5**

**Ans 5.**

**a. Definition of Sequential Circuits and Role of Flip-Flops**

**Sequential Circuits**

Sequential circuits are a type of digital circuit in which the output not only depends on the current inputs but also on the past sequence of inputs. This means sequential circuits have a memory element that stores information about previous states. Unlike combinational circuits, which generate output based solely on present input, sequential circuits store and process data in a time-dependent manner.

Sequential circuits are classified into two types: Synchronous and Asynchronous. In

**Q6.a. Differentiate between synchronous and asynchronous counters. Which one is preferred for high-speed applications and why? 5**

**b. What are shift registers? Explain any two applications. 5**

**Ans 6.**

**a. Difference Between Synchronous and Asynchronous Counters**

**Counters in Digital Electronics**

Counters are sequential circuits used to count pulses and are built using flip-flops. They find applications in digital clocks, frequency counters, timers, and many digital systems. Counters can be broadly classified into two types: Synchronous and Asynchronous counters, based on how the clock signal is applied.

**Asynchronous Counters**

In asynchronous counters, also known as ripple counters, only the first flip-flop is triggered