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**Lab no 02**

**SAP 61278**

**QS NO 1:**  **Describe the function of each ?**

• **Accumulator Register (A, AX, EAX, RAX):**

* These registers are primarily used to carry out mathematical and logical operations in the CPU. They are commonly referred to as "working" registers because they are involved in most calculations, such as addition or subtraction.
* The sizes of these registers differ: AX is 16-bit, EAX is 32-bit, and RAX is 64-bit. The size used depends on the data being processed—AX for smaller data and EAX or RAX for larger data types.

• **Base Register (B, BX, EBX, RBX):**

* The main function of these registers is to store memory addresses. When accessing data from memory, the base register holds the address of the data location.
* As with the accumulator, these registers come in different sizes: BX (16-bit), EBX (32-bit), and RBX (64-bit).

• **Count Register (C, CX, ECX, RCX):**

* This register is utilized for counting purposes, particularly in loop operations or repetitive tasks, where it helps determine how many times an operation should be performed.
* The sizes of the register are: CX (16-bit), ECX (32-bit), and RCX (64-bit), representing the number of times a particular operation will be repeated.

• **Data Register (D, DX, EDX, RDX):**

* The data register temporarily holds data for processing. It is especially used for storing data before or after an operation. It also plays a significant role in tasks like input/output (I/O) operations.
* DX (16-bit), EDX (32-bit), and RDX (64-bit) are the sizes of these registers.

**QS NO 2 : Describe the role of index registers in source and destination operations. Provide an example using SI and DI in an assembly instruction?**

**Index Registers** are special-purpose registers in the CPU used to store memory addresses that point to specific locations in memory. These registers help in accessing data efficiently, especially when performing operations like moving or manipulating data between memory locations. The most common index registers in x86 assembly are **SI** (Source Index) and **DI** (Destination Index).

**Role of Index Registers (SI and DI) in Source and Destination Operations:**

1. **Source Index (SI):**
   * The **SI** register holds the memory address of the source, which is where the data is located.
   * When the CPU needs to access or transfer data, it refers to the address in the **SI** register to locate the source data.
2. **Destination Index (DI):**
   * The **DI** register holds the memory address of the destination, which is where the data should be moved or stored.
   * Once the CPU retrieves the data from the **SI** address, it uses the **DI** address to know where to place or move the data.

**QS NO 3: Briefly describe the functions of these bits?**

**Flags in the CPU:** Flags are special bits that help track the outcomes of operations in the CPU.

• **Overflow Flag (OF):**

* This flag is set when the result of an operation exceeds the limits of the register, either due to the result being too large or too small (e.g., adding two large numbers may result in an overflow).

• **Zero Flag (ZF):**

* This flag is triggered when the result of an operation equals zero. For example, subtracting two equal numbers (like 10 - 10) sets the Zero Flag.

• **Carry Flag (CF):**

* The Carry Flag is set when an operation results in a carry-out during addition or a borrow during subtraction. For example, adding two numbers that exceed the maximum value of the register would trigger the Carry Flag.