تكليف الطالب/عبداالله عبدالكريم مفضل المجموعه الثانيه

**3.1 What general categories of functions are specified by computer instructions**

1. **Data Transfer**: Moving data between memory, registers, and I/O devices (e.g., load, store, move).
2. **Arithmetic and Logic Operations**: Performing calculations and logical operations (e.g., add, subtract, AND, OR).
3. **Control Flow**: Directing the execution of the program (e.g., jumps, branches, calls, and returns).
4. **Input/Output Operations**: Managing data exchange with peripheral devices (e.g., read, write).
5. **System Control**: Handling special instructions for system operations (e.g., interrupts, status checking).

**3.2 List and briefly define the possible states that define an instruction execution.**

 **Fetch**: The CPU retrieves an instruction from memory (typically from the program counter) to be executed.

 **Decode**: The fetched instruction is interpreted or decoded to understand what operation needs to be performed.

 **Execute**: The CPU carries out the instruction's operation, such as performing calculations or moving data between registers.

 **Memory Access**: If needed, the CPU accesses memory to either read or write data during execution.

 **Write-back**: The result of the instruction (if any) is written back to a register or memory.

 **Interrupt/Idle**: If an interrupt occurs or there’s no instruction to execute, the CPU either handles the interrupt or enters an idle state until the next instruction is ready.

**3.4 What types of transfers must a computer’s interconnection structure (e.g., bus) support?**

 **Memory to Processor Transfer**: Data or instructions stored in memory are transferred to the processor for execution.

 **Processor to Memory Transfer**: The processor writes data or results from computations back into memory.

 **I/O to Processor Transfer**: Input data from external devices (e.g., keyboard, mouse) is transferred to the processor for processing.

 **Processor to I/O Transfer**: The processor sends data or commands to output devices (e.g., monitor, printer).

 **I/O to Memory Transfer (Direct Memory Access, DMA)**: Data is transferred directly between I/O devices and memory without involving the processor, improving efficiency.