Assignment-2

1. Explain about different types of Instruction set and Assembler directives.

A. Instruction set

⇒ Data Transfer instruction
⇒ Arithmetic and Logical Instructions.
⇒ shift and Rotate Instructions
⇒ Loop Instructions.
⇒ Branch Instructions
⇒ String Instructions
⇒ Flag Manipulation Instructions
⇒ Machine Control Instructions.

1. Data Transfer Instruction:-

⇒ All the instructions which perform data movement come Under this category. The source data may be a register, memory location, port etc. the destination may be a register, memory location or port.

Instructions,

MOV ⟶ Moves data from register to register, register to memory, memory to register, memory to accumulator, accumulator to memory, etc.

LDS ⟶ Loads a word from the specified memory locations into Specified register. It also loads a word from the next two memory locations into Ds register.

LEA ⟶ Loads offset address into the specified register.

LAHF ⟶ Loads low Order 8-bits of the flag register into AH reg

XLAT/XLATB ⟶ Reads a byte from the lookup table.

2. Arithmetic Instructions:

→ Instructions of this group perform addition, Subtraction, multiplication, division, increment, decrement, comparison, ASCII and decimal adjustment etc.

ADD → Adds data to the accummulator i.e. AL or AX register

ADC → Adds specified operands and the carry status.

SUB → Subtract immediate data from accumulator, memory.

MUL → Unsigned 8-bit or 16-bit multiplication.

DEC → Decrement register or memory by 1.

CBW → Convert Signed Byte to Signed Word.

3. Logical Instructions.

Instructions of this group perform logical AND, OR, XOR, NOT and TEST operations.

AND → Performs bit by bit logical AND operation of two operands and places the result in the specified destination.

OR → Performs bit by bit logical OR operation of two operands

TEST → Perform logical AND operation of a specified operand with another specified operand.

4. Rotate Instructions:-

RCL → Rotate all bits of the operand left by specified number of bits through carry flag.

ROL → Rotate all bits of the operand left by specified number of bits.

ROR → Rotate all bits of the operand right by specified number of bits.

Assembler directives:

The Various Directives are:

1. ASSUME :- The ASSUME directive is used to inform the assembler the name of the logical segment it should use for a specified segment.
2. DW- Define word. It tells the assembler to define a variable of type word or to reserve storage locations of type word in memory.
3. DQ (define quadword): This directive is used to tell the assembler to declare a variable 4 words in length.
4. DT (define ten bytes): It is used to inform the assembler to define a variable which is 10 bytes in length.
5. ORG:- Originate :- The ORG statement changes the starting offset address of the data.
6. ENDP :- End procedure :- It indicates the end of the procedure to the assembler.

2. With an Example. (Examp) Explain division algorithm.

A. Division of two fixed-point binary numbers in signed magnitude representation is performed with paper and pencil by a process of successive compare, shift and subtract operations. Binary division is much simpler than decimal division because here the quotient digits are either 0 or 1 and there is no need to estimate how many times the dividend or partial remainder fits into the divisor.

Ex:- Divisor:

B = 10001

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          11010          Quotient = Q
)011100000000
  01110                  Dividend = A
  011100
  -10001                 5 bits of A < B, quotient has 5 bits
  -010110                6 bits of A ≥ B
  --10001                shift right B and subtract; enter 1 in Q
  --001010
  ---010100              4 bits of remainder ≥ B
  ----10001              shift right B and subtract: 1 in Q
  ----000110
  -----00110             Remainder < B; enter 0 in Q, Final remainde
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The devisor is compared with the five most significant bits of the dividend. Since the 5-bit number is smaller than B, we again repeat the same process. Now the 6-bit number is greater than B.

If the partial remainder is smaller than the divisor, the quotient bit is 0 and no subtraction is needed. The divisor is shifted once to the right in any case. Obviously the result gives both a quotient and a remainder.

3. Discuss about Priority Interrupt.

A. i) Data transfer between the CPU and an I/O device is initiated by the CPU. However, the CPU cannot start the transfer unless the device is ready to communicate with the CPU.

ii) A priority interrupt is a system that establishes a priority over the various sources to determine which condition is to be serviced first when two or more request arrive simultaneou The system may also determine which conditions are permitted

to interrupt the computer while another interrupt is being serviced.

ii) The disadvantage of the software method is that are many interrupts, the time required to poll them can exceed the time available to service the I/O device. In this situation a hardware priority-interrupt Unit can be used to speed up the operation.

iii) A hardware priority-interrupt Unit functions as an Overall manager in an interrupt system environment. It accepts interrupt requests from many sources, determines which of the incoming requests has the highest priority, and issues an interrupt to the computer based on this determination.

4. Explain about RAM, ROM.

A. RAM (Random Access Memory)

Random Access Memory is used to store the programs and data being used by the CPU in real time. The data on the random access memory can be read, written, and erased any number of times. RAM is a hardware element where the data currently used is stored. It is a volatile memory. It is also called as Main Memory or Primary Memory. This is Users memory. The software as well as data files are stored on the hard disk when the software or those files are opened. They get expanded into RAM. It id a Users space where the temporary data are automatically stored till

the User saves it into the secondary storage devices.

Types of RAM:

Static RAM:- Static RAM or SRAM stores a bit of data Using the state of a six-transistor memory cell.

Dynamic RAM: Dynamic RAM or DRAM stores a bit of data Using a pair of transistors and capacitors which constitute a DRAM memory cell.

ROM(Read Only Memory):

Read Only Memory (ROM) is a type of memory where the data has been prerecorded. Data stored in ROM is retained even after the computer is turned off i.e., non-volatile. It is generally used in Embedded Parts, where the programming requires almost no chages. It is also called as Secondary Memory. It stores a program called BIOS. This Program checks the status of all the devices attached to the computer.

Types of ROM.

1. Programmable ROM:- Type of ROM where the data is written after the memory chip has been created.
2. Erasable Programmable ROM:
3. Electrically Erasable Programmable ROM.
4. Mask ROM:

5. Discuss about Instruction pipeline.

A. Pipline processing can occur not only in the data stream but in the instruction stream as well.

Most of the digital computers with complex instructions require instruction pipeline to carry out operation like fetch, decode and execute instructions.

The computer needs to process each instruction with the following steps.

1. Fetch instruction from memory.
2. Decode the instruction.
3. Calculate the Effective address.
4. Fetch the operands from memory.
5. Execute the instruction.
6. Store the result in the proper place.

Each step is executed in a particular segment, and there are times when different segments may take different times to operate on the incoming information.

A four-segment instruction pipeline combines two or more different segments and makes it as a single one.