MICROPROCESSOR & INTERFACING

1. Define Microprocessor?
Microprocessor is a multipurpose, programmable, clock-driven, register based electronic device that reads binary instructions from a storage device called memory, accepts binary data as input and processes data according to those instructions, and provides as output.

2. What is Hardware and Software?
The physical components of the system i.e. computer are called Hardware. Group of programs is called software.

3. Why the microprocessor is viewed as a programmable Device?
Microprocessor is programmable because it can be instructed to perform given tasks within its capability. Microprocessor is designed to understand and execute many binary instructions.

4. What is Central processing Unit (CPU) ? And Write the use of it.
CPU is a heart of the computer. Central processing Unit controls the operation of the computer. In a microcomputer the CPU is a microprocessor. The CPU fetches binary coded instructions from memory, decodes the instructions into a series of simple actions and carries out these actions in a sequence of steps.

5. What is a chip?
A chip is also called an integrated circuit. Generally it is a small, thin piece of silicon onto which the transistors making up the microprocessor have been etched. A chip might be as large as an inch on a side and can contain tens of millions of transistors. Simpler processors might consist of a few thousand transistors etched onto a chip just a few millimeters square.

6. What is mini computer?
Scaled down versions of mainframe computers are often called minicomputers. The main unit of a minicomputer usually fits in a single rack or box. A mini computer runs more slowly, works directly with smaller data words and does not have as much memory as mainframe. computers of this type are used for business data processing, industrial control and scientific research

7. What is System Bus?
The System bus is a communication path between the microprocessor and peripherals. It is nothing but a group of wires to carry bits.

8. What is Address Bus?
The address bus consists of 16, 20, 24 or 32 parallel signal lines. On these lines the CPU sends out the address of the memory location that is to be written to or read from. The number of memory locations that the CPU can address is determined by the number of address lines. If the CPU has N address lines, then it can directly address 2N memory locations. Simply, we can say that Address Bus is used to carry the address.

9. What is Data Bus?
The data bus consists of 8, 16, or 32 parallel signal lines. The data bus lines are bidirectional. This means that the CPU can read data in from memory or from a port on these lines, or it can send data out to

memory or to a port on these lines. Simply we can say that data bus is used to carry the data .

10. What is Assembly Language?
A medium of communication with a computer in which programs are written in mnemonics. Binary instructions are given abbreviated names called mnemonics, which form the assembly language for a given processor.

11. What is Machine Language?
The binary medium of communication with a computer through a designed set of instructions specific to each computer.

12. Define Embedded Systems:
Embedded systems are those used to control specialized hardware in which the computer system is installed. Microprocessor is the final product and is not available for reprogramming to the end user. E.g. Copying machine

13. What is Bit-Slice processor?
For some Applications , general purpose CPUs such as the 8080 and 6800 are not fast enough or do not have suitable instruction sets. For these applications ,several manufacturers produce devices which can be used to build the custom CPU. This family includes 4 bit ALUs, multiplexers, sequencers and other parts needed for custom building a CPU. The term slice comes from the fact that these parts can be connected in parallel to work with 8 bit words, 16- bit words, or 32 bit words.

14. What is microcontroller?
Microcontroller is a Device that includes microprocessor, memory and I/O signal lines on a single chip, fabricated using VLSI technology.

15. Write about the importance of instruction set of Z80 8bit microprocessor?
Instruction set 158 basic instructions . Instruction set is the most powerful set among the 8 bit microprocessors. It does not include two serial I/O instructions. It includes block I/O instructions

16. List the main applications of 8 bit microprocessors?
8 bit microprocessors is used in a variety of applications such as appliances , automobiles ,industrial process and control applications.

17. Write the uses of microprocessors in Medical Instrumentation field?
Patient Monitoring in Intensive Care Unit, Pathological Analysis and the measurement of parameters like blood pressure and temperature.

18. Define Real Time Systems :
Real Time Systems are those in which timeliness is as important as the correctness of the outputs, although this does not mean that they have to be "fast systems".

19. List the limitations of 8 bit microprocessor:
Lower Execution Speed
It can address less memory size
Few instructions are available

20. What do you mean ' Data Width'?

Data Width is the width of the ALU. An 8 bit ALU can add / subtract/ multiply etc..two 8 bit numbers . In many cases, the external data bus is the same width as the ALU, but not always. The 8088 had a 16 bit ALU and 8 bit bus , while the modern Pentiums fetch data 64 bits at a time for their 32 bit ALUs.

21. Draw and specify the complete bit configuration of 8085 flag Register?
D7 D6 D5 D4 D3 D2 D1 D0
S Z AC P CY
S- Sign Flag . If D7 =1 , then sign flag is set, otherwise rest.
Z-Zero flag. If ALU operation results in zero, then this flag is set, Otherwise it is reset.

AC-Auxilliary flag. In an arithmetic operation ,when a carry is generated by digit D3 and passed on to digit D4, the AC flag is set. Otherwise it is reset.
P-Parity Flag. If the result of an arithmetic or logic operation has an even number of 1's then this flag is set. Otherwise it is reset.
CY-Carry Flag. If an arithmetic operation results in a carry, the carry flag is set. Otherwise it is reset.

22. What is compiler?
Compiler is a program that translates English like words of a high level language into the machine language of a computer. A compiler read a given program ,called a source code, in its entirely and then translates the program into the machine language, which is called an Object Code.

23. List the four operations commonly performed by MPU(Micro processing Unit)?
Memory Read : Reads data (or instructions) from memory.
Memory Write: Writes Data (or instructions) into memory.
I/O Read: Accepts data from input devices.
I/O Write: Sends data to output devices.

24. Write about RST pins in 8085?
In 8085 ,three RST pins are available, such as RST 7.5 ,RST 6.5 , RST 5.5 RST represents Restart Interrupts. These are vectored interrupts that transfer the program control to specific memory locations. They have higher priorities than the INTR interrupt. Among these three, the priority order is 7.5,6.5,5.5.

25. List the control and status signals available in 8085.
----- ------ ---- ALE , RD, WR, IO/M, S1, S2
ALE-Address Latch Enable

RD – Read Control Signal

WR – Write Control Signal

IO/M - To specify I/O or memory operation
S1 , S2 – Status signals

26. What are the limitations of 8085 MPU?
(i) The lower order address bus of the 8085 microprocessor is multiplexed (time shared) with the data bus. The buses need to be demultiplexed.
(ii) Appropriate control signals need to be generated to interface memory and I/O with the 8085.

27. Compare the 8 bit microprocessors 8080A and 8085.

8080A is the predecessor of 8085. 8085 has the instruction set of 8080A plus some additional ones. Program written for 8080A will be executed by 8085. 8085 and 8080A are not pin compatible. Both require a +5V power supply.

28. Define Register Relative Addressing Mode.
Register Relative Addressing Mode : The Effective Address is Calculated by the sum of 8- or 16 bit displacement and the contents of a base Register or an index Register. E.A. = content of(BX or BP or SI or DI) + (8 bit displacement (sign extended) or 16 bit displacement Physical Address = E.A +(DS)*1610

29. Define Immediate Addressing.
An 8 bit or 16 bit immediate data follows the instruction. For e.g MOV AX,5020H instruction transfers a word 5020H to the AX register .

30. Define Direct Addressing mode :
A 16 bit offset address of the data memory location is specified with reference to the DS segment starting address. For.E.g MOV [1020H],5020H instruction transfers a word 5020H to the data memory location at 11020H if DS=1000H.

31. Define Relative based indexed addressing mode:
Relative Based Indexed Addressing Mode : Effective Address is calculated by the sum of 8- or 16 bit displacement and a based indexed address. E.A.= (BX or BP) + (SI or DI) +(8 bit displacement (sign extended) or 16 bit displacement) Physical Address= E.A + (DS)*1610

32. List the branch related addressing mode:
Intra segment Direct
Intra segment Indirect
Inter segment Direct
Inter Segment Indirect

33. List the functions of Bus Interface Unit in 8086.
Sends out addresses
Fetches instructions from memory
Reads data from ports and memory
Writes data to port and memory

34. Write any two advantages of segment registers in 8086
a. It allows the memory capacity to be 1MB even though the address associated with individual instructions are 16 bits wide.
b. It allows the instruction,data, or stack portion of a program to be more than 64KB long by using more than one code, data, or stack segment

35. What is the use of Instruction pointer in 8086 ?
Instruction pointer holds the 16 bit address of the next code byte within the code segment. The value contained in the IP is called effective address or offset. It contains the distance from the base address to the next instruction byte to be fetched.

36. Write about the auxiliary carry flag used in 8086 ?
It is set if there is a carry out of bit 3 during an addition or a borrow by bit 3 during a subtraction. This flag is used exclusively for BCD arithmetic.

37. When the Overflow flag is set ?
For addition of 16 bits, this flag is set when there is a carry into the MSB and no carry out of the MSB.

38. Define Register addressing mode:
Datum is in the register that is specified by the instruction
E.g : MOV CX,AX (16 bit operand)
MOV CL,AL (8 bit operand)

39. Define Register Indirect Addressing mode:
Effective address of the datum is in the base register BX or an index register that is specified by the instruction.

40. Define Register relative addressing mode:
The effective address is the sum of an 8- or 16 bit displacement and the contents of a base register or an index register.

41. Define Based Indexed addressing mode:
The effective address is the sum of a base register and an index register , both of which are specified by the instruction.It is also called as Base related Indexed addressing.

42. Define Intra segment direct addressing mode:
The effective branch address is the sum of an 8- or 16 bit displacement and the current contents of IP.

43. Define Intra segment Indirect addressing mode:
The effective branch address is the contents of a register or memory location that is accessed using any of the data related addressing modes except the immediate mode. The contents of IP are replaced by the effective branch address.

44. Define Inter segment addressing mode:
It replaces the contents of IP with part of the instruction and the contents of CS with another part of the instruction.

45. Define Inter segment Indirect addressing mode:
It replaces the contents of IP and CS with the contents of two consecutive words in memory that are referenced by using any of the data related addressing modes except immediate and register modes.

46. What is the use of PUSHF instruction used in 8086 ?
It pushes the flag register contents to the top of the stack. No flags are affected.

47. Define XLAT instruction used in 8086.
It translates a byte in AL using a table in memory. The offset address is calculated by adding the 8 bit contents of the AL register and the contents of BX register. BX register contains the starting offset address of the Lookup table . After execution , corresponding data memory contents of the lookup table are loaded into the AL register.

48. What is the use of 'W' bit in opcode ?.
W bit in op-code : If an instruction in 8086 can operate on either a byte or a word , the op-code includes a W-bit which indicates whether a byte (W =0) or a word (W =1) is being accessed.

49. What is DAS instruction ?
DAS : Decimal Adjust After Subtraction This instruction converts the binary result of a SUB or SBB instructi on in AL to Packed BCD format. It operates only on AL Register.

50. What is Packed BCD Format ?
Packed BCD Format : Packed BCD Numbers are stored in two digits to a byte , in 4 bit groups referred to as nibbles. ALU is capable of performing only binary addition and subtraction , but by adjusting the sum or difference the correct result in packed BCD format. 51. What is the value of 'AX' after executing following instructions.
MOV AH,00
MOV AL,'7'
ADD AL,'3'
AAA
Ans : AX= 0100 H

52. What is difference between DIV and IDIV instruction in 8086 ?
DIV : It operates only on unsigned number.
IDIV : It operates only on signed numbers.

53. Write about the following instruction : MOV CS:[BX], DL
MOV CS:[BX],DL - It copies a byte from DL Register. Effective Address for the memory location is contained in the BX Register. Normally an effective address in BX will be added to the data segment base in DS to produce the physical memory address. In this instruction CS: indicates that we want the BIU to add the effective address to the code segment base in CS to produce the physical address. content of(BX+(CS) * 1610) = (DL)

54. What is Programmed I/O ?
Programmed I/O : It consists of continually examining the status of an Interface and performing an I/O operation with the Interface when its status indicates that it has data to be input or its data- out buffer register is ready to receive data from the CPU.

55. What is the use of Directives in 8086 ?
Directives in 8086 give directions to the assembler during the assembly process but are not translated into machine instruction.

56. What is AAS instruction in 8086 ?
AAS : Adjust Result of ASCII Subtraction
This instruction adjust the binary result of SUB or SBB instruction.

57. What is Unpacked BCD Format ?
Unpacked BCD Format : In Unpacked BCD, there is only one digit per byte and because of this,unpacked multiplication and division can be done. Binary operations act on signle bytes and the results are adjusted. For Division , the adjustment is done before the binary division.

58. What is the value of AL after executing the following instructions.
MOV AL,35H
ADD AL,49H
DAA

Ans : AL= 84

59. Define Segment Override Prefix.
Segment Override Prefix : To permit exceptions to the Segment Register usage, a special one byte instruction called a segment override prefix is available . It is of the form : X XXXXXXX
Mod REG R/M

60. Write the difference between CBW and CWD instruction in 8086.
CBW : Convert a byte to a word, sign extend AL Register into a AH Register.
CWD : Convert a word to a double word ,sign extend the AX Register into the DX Register.

61. Write about the following instruction : LES CX, [3483H]
Copy the contents of memory at the displacement of 3483H in DS to CL, contents of 3484H in DS to CH, and copy the contents of memory at displacement of 3485H and 3486H in DS to ES Register.

62. What is the use of D bit in opcode?
D bit: It is used in double operand instruction. It is used to indicate whether the register specified by REG is the source operand (D=0) or the destination operand (D=1).

63. What is the use of V bit in opcode ?
It is used by shift and rotate instructions to determine the number of shifts. V bit is set to 0 if the shift count is to be 1. V bit is set to 1 if the CL register contains the shift count.

64. Write the use of Z bit in opcode?
It is used by REP instruction. Z bit helps to control the loop. It will be repeated the number of items indicated by the CX register or until Z bit dose not match the Zero flag whichever occurs first.

65. How the execution time of an instruction is calculated?
Execution time of an instruction can be determined by multiplying the number of clock pulses needed to execute the instruction by the clock period.

66. Define EQU directive in 8086 assembly language?
It is used to assign a name to constants used in the programs. Consider the statement 'corr EQU 07H' , this would tell the assembler to insert the value 07H everytime that it finds the name corr in the program statement.

67. Write the use of Assume directive in 8086 assembly language using one example?
Assume CS: code_here, DS:data_here It tells the assembler that the logical segment code_here contains the instruction statements for the program and should be treated as a code segment. It also tells the assembler that it should treat the logical segment data_here as the data segment for this program.

68. Define EXTRN directive in in 8086 assembly language?
The EXTRN directive is used to inform the assembler that the names or labels following the directive are in some other assembly module.

69. What is Emulator?
Emulator is a mixture of hardware and software .It is used to test and debug the hardware and software of an external system such as the prototype of a microprocessor based instrument.

70. What is the use of TEST instruction in 8086?
Test instruction is the same as the AND instruction except that ite does not put the result anywhere. Like the CMP instruction , it is used only to set the flags.

71. Define LAHF and SAHF instructions in 8086.
LAHF : Load the 8085 equivalent flags into the AH register.
SAHF: Store the AH register into the low order byte of the flag register.

72. While handling the interrupt instructions in 8086, What are the internal operations may be carried out by the stack?
(i)SP =SP-2 , stack ? Push flag reg. Contents, IF =0 , TF =0
(ii) SP=SP-2, Stack? CS Reg. Contents, Address of Interrupt pointer = Interrupt type * 4 , CS Register Contents ? Second word of Interrupt pointer
(iii) SP=SP-2, Stack? IP, IP? First word of Interrupt pointer

73. Write an ALP program in 8086 to add two 16 bit numbers.
MOV AX,1236H
MOV BX,8765H
ADD AX,BX
HLT

74. Write about EVEN directive in 8086 ALP.
It forces the address of the next byte to be even. 8086 words can be accessed in less time if they begin at even address.

75. Write about the following instruction :
Call WORD PTR [BX]
Offset of the first instruction of procedure is in two memory addresses in DS. It replaces the contents of IP with contents of word memory locations in DS pointed to by BX.

76. Write an ALP program in 8086 to subtract numbers.
MOV AX,1236H
MOV BX,8765H
SUB AX,BX
HLT

77. When the 8086 processor is in minimum mode?
The processor 8086 is in minimum mode when its MN/MX pin is strapped to +5 V

78. When the 8086 processor is in maximum mode?
The processor 8086 is in maximum mode when its MN/MX pin is grounded.

79. Define latch.
A bistable circuit that is set and reset by appropriate input signals . An electronic circuit that records the status of a signal until it is reset.

80. Define clock pulse.
A synchronization signal provided by a clock . A periodic signal used for synchronization and for measuring intervals of time.

81. What is the use of s1 , s2 ,s3 signals when 8086 is in maximum mode?
It indicates the type of transfer to take place during the current bus cycle.

82. Define Machine cycle.
A group of states required for a basic bus operation is called a machine cycle.

83. Write any three differences between 8086 and 8088?
a. 8086 – 20 address lines , 16 data lines
8088 – 20 address lines, 8 data lines

b. (Maximum Mode) 8086 – M/IO $\overline{}$ 8088 – IO/M
c. 8086 uses a maximum supply current of 360 mA 8088 uses a maximum supply of 340mA

84. Define Instruction cycle?
The total time takes the 8086 to fetch an instruction is called an instruction cycle. Instruction cycle consists of one or more machine cycles. Each machine cycle is made up of states.

85. What is polling?
In programmed I/O , testing of ready bits or signals is known as polling.

86. Define Interrupt I/O?
Interrupt is an event that causes the CPU to initiate a fixed sequence known as an interrupt sequence.

87. What do you mean by wait states in system bus timing?
Wait states are inserted between T3 and T4, when a memory or I/O interface is not able to quickly enough during a transfer.

88. What is block transfer?
To execute a sequence of instructions that causes a special system component associated with the interface to transfer a sequence of bytes or words to or from a predesignated block of memory locations . It is called a block transfer.

89. What is the use of A1,A2 pins 8255A ?
A1 and A0 determine which register is to be selected. It determines the port address. If A1 A0 = 11, the control port is accessed.

90. Write about mode 1 in 8255A?
Mode 1 is intended for handshaking and interrupt –driven I/O interfaces. In this mode ports A and B are programmed as data ports and port C is programmed to carry status signals. In this mode , the data transfers can take place without direct CPU intervention.

91. Define Stop bit.
Bit or group of bits that identifies the end of a data word and defines the space between data words. Bit indicating the end of an asynchronous serial transmission.

92. Define Baud Rate:
The data rate can be expressed as bits/sec or characters/sec . The term bits/sec is called baud rate.

93. Define Modem.
Acronym for modulator/Demodulator. A device that translates digital pulses from a computer into analog signals for telephone transmission and analog signals from the telephone into digital pulses the computer can understand.

94. Define synchronous Communication.
It means regular time relationship. Pertaining two or more processes that depend upon the occurence of specific events such as common timing signals.

95. What is overrun error ?
Loss of data because a receiving device is unable to accept data at the rate it is transmitted.

96. What is the use of ADSTB signal in 8237?
ADSTB is Address Strobe. Same as address latch enable signal. It is used by DMA controller to latch the address bits A15-A8 during DMA transfer.

97. What is the use of Current Byte count register?
It programs a channel for the number of bytes transferred during a DMA action. The number loaded into this register is one less than the number of bytes transferred.

98. Define Asynchronous Communication.
Without regular time relationship. Transmission of a character or a block of characters can begin at any time , but in which the bits that represent the character or block have equal time duration.

99. Write about 80486 processor?
It is an enhanced version of 80386. It executes instructions in one clocking period. It also contains 8k byte cache memory. Pentium and Pentium pro also contain improved numeric co-processors that operate 5 times faster than 80486 numeric co-processor.

100. What is the difference between 80186 and 80188?
Difference between these two is width of their data buses. 80186 has 16 bit data bus and 80188 has 8 bit data bus.