UNIT I

THE 8086 MICROPROCESSOR

1. What are the modes in which 8086 can operate?
The 8086 can operate in two modes and they are minimum (or uniprocessor) mode and maximum (or multiprocessor) mode.

2. What are the interrupts of 8086?
The interrupts of 8085 are INTR and NMI. The INTR is general mask able interrupt and NMI is non-mask able interrupt.

3. How clock signal is generated in 8086? What is the maximum internal clock frequency of 8086?
The 8086 does not have on-chip clock generation circuit. Hence the clock generator chip, 8284 is connected to the CLK pin of 8086. The clock signal supplied by 8284 is divided by three for internal use. The maximum internal clock frequency of 8086 is 5MHz.

4. What is pipelined architecture?
In pipelined architecture the processor will have number of functional units and the execution times of functional units are overlapped. Each functional unit works independently most of the time.

5. What are the functional units available in 8086 architecture?
The bus interface unit and execution unit are the two functional units available in 8086 architecture.

6. List the segment registers of 8086.
The segment registers of 8086 are Code segment, Data segment, Stack segment and Extra segment registers.

7. What is the difference between segment register and general purpose register?
The segment registers are used to store 16 bit segment base address of the four memory segments. The general purpose registers are used as the source or destination register during data transfer and computation, as pointers to memory and as counters.

8. What is queue? How queue is implemented in 8086?
A data structure which can be accessed on the basis of first in first out is called queue.The 8086 has six numbers of 8-bit FIFO registers, which is used for instruction queue.

9. List the general purpose registers of 8086.
AX 16-bit Accumulator SP-Stack pointer
AL 8-bit Accumulator BP-Base pointer
BX Base Register SI-Source index
CX Count Register DI-Destination index
DX .Data Register

10. Write the flags of 8086.
The 8086 has nine flags and they are
1. Carry Flag (CF) 6. Overflow Flag (OF)

2. Parity Flag (PF) 7. Trace Flag (TF)
3. Auxiliary carry Flag (AF) 8. Interrupt Flag (IF)
4. Zero Flag (ZF) 9. Direction Flag (DF)
5. Sign Flag (SF)

11. What are control bits?

The flags TF, IF and DF of 8086 are used to control the processor operation and so they are called control bits.

12. Describe the difference between the instructions MOV AX, 2437H and MOV AX, [2437H].

Difference between the instructions MOV AX, 2437H and MOV AX,[2437H] are former instruction takes 2437 as 16-bit data and latter instruction takes 2437 as 16-bit address.

13. State the function of Direction flag in 8086.

Direction flag is used with string instructions. If DF= 0, the string is processed from its beginning with the first element having the lowest address. Otherwise, the string is processed from the high address towards the low address.

14. What is the data & address size in 8086?

The 8086 can operate on 8-bit or 16-bit data. The 8086 uses 20-bit address to access memory & 16-bit address to access I/O devices.

15. What is the difference between 8086 & 8088?

The external data bus in 8086 is 16-bit & that of 8088 is 8-bit.i.e., The 8086 access memory in words but 8088 access memory in bytes.

16.Explain the function of M/IO in 8086.

The signal M/IO is used to differentiate memory address & I/O address. when the processor is accessing memory locations M/IO is asserted high & when it is accessing I/O mapped devices it is asserted low.

17. MOV BX,0301H

MOV SI, 1548H

MOV [BX+SI], 3492H

What will be the result of executing the above instructions? (April 2004 EE)

MOV BX, 0301H- Register BX is immediately loaded with a 16 bit data 0301.

MOV SI, 1548H – SI loaded with 1548.

MOV [BX+SI], 3492H – the content of data segment is converted into 20bit

address and added with the contents of BX and SI (DS+BX+SI).the data 3492h is

stored in the address thus generated.

18. What is the function DEN? When will it be active for read and write cycle? (April 2004 EE)?

– Data enable

This signal informs the transceivers that the CPU is ready to send (or) receive Data.

19. Write down the segment registers and their corresponding default offset register in 8086.(NOV/DEC 2003 EC)

The 8086 is a 16 bit processor which means all its register can hold only 16 bits. However the processor has 20 address lines. In order to handle 20 bit address the segmented memory concept is used. The memory is divided into segment of 64kilobyte. Each segment is identified by a segment number which is also known as the segment address. With the segment a memory location is identified by n offset address.

The 8086 has 4 segment registers to store the segment address. They are

CS – code segment
DS – data segment
SS – stack segment
ES – extra segment

20. Write down the function of TF and DF flags.

TF- Trap flag

One way to debug a program is to run the program one instruction at a time and see the contents of used registers and memory variables after execution of every instruction. This process is called single stepping through a program. Thus programmer can easily trace and correct errors in the program.

DF- direction flag:

It is used with string with instructions. If DF=0 the string is processed from its beginning with the first element having the lowest address. Other wise, the string is processed from the high adders towards the low address.

21. Specify the functions of TEST (active low), and MN/ pin in 8086.

(NOV/DEC-2005 EC).

TEST (active low): (input)

This signal is only used by the WAIT instruction. The 8086 enters into a wait state after execution of the wait instruction until a low signal on the TEST (active low) pin. It is synchronized internally during each clock cycle on the leading edge of the clock cycle. Activated by the LOCK prefix. This signal indicates that an instruction with a lock prefix is being executed and the bus is not to be used by another processor. Locks the bus from being relinquished for DMA or other bus masters. MN/: (input) The 8086 can be configured in either minimum mode (or) maximum mode using this pin. This pin is tied high for minimum mode.

22. What is the operation carried out when XLAT instruction is executed by 8086?

This instruction translates byte in AL register. It is replaces a byte in the AL register with a byte from a lookup table in memory. BX register stores the offset of the starting address of the lookup table and AL register stores the byte number from the lookup table. This instructions copies byte from address pointer by (BX+AL) back into AL.

23. What is instruction pipelining?

In pipelining architecture the processor will have number of functional units and the execution time of functional units is over lapped. Each functional unit works independently most of the time.

24. What is DAA instruction?

DAA- decimal adjust accumulator.

This instruction is used to make sure the result of adding 2 packed BCD

Number is adjusted to be legal BCD number. Only works for AL.

ADD AL, CL

Before execution AL = 39, CL = 12

AL = 39 0011 1001

CL = 12 0001 0010

0100 1011

+06 0000 0110

0101 0001

----
5 1
After execution AL = 51
25. What do you meant by maximum and minimum mode operation of 8086?
The minimum mode is used for a small system with a single processor and nminimum mode is for medium size to large systems, which often include two or more processors.
26. Draw the complete bit configuration of flag register of 8086. Also give the use of
IF and OF flags?
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

U U U U OF DF IF TF SF ZF U AF U PF U CF

CF- carry flag
PF – parity flag
AF – Auxiliary carry flag
ZF – zero flag
SF – sign flag
TF – Trap flag
DF- direction flag
OF- overflow flag- it is used to set if an overflow occurs a result in out of range.
IF- interrupts flag. - It is used to allow – prohibit the interruption of a program. If
set 1 a certain type of interrupt a mask able interrupt can be recognized by 8086.
27. What are assembler directives? Give examples.
Assembler directives also called as assembler pseudo instructions. This is instruction used by the assembler. They produce no executable code for the processor and normally do not take up any memory locations. They are used by the assembler to make programming easier.
Example:
ASC – stores data in memory in ASCII
BIN - stores data in binary format.
28. Mention the function of the following signals of 8086?
(i)- :low on this pin during first part of the machine cycle, indicates that at least one byte of the current transfer is to be made on higher order byte $AD_{15} - AD_{8}$; otherwise the transfer is made on lower order byte $AD_7- AD_0$.
(ii)- :In the maximum mode, HOLD and HLDA pins are replaced by (bus request)/ (Bus grant), by using bus request signal another master can request for the system bus and processor communicate that the request is granted to the requesting master by using bus grant signal.
29. What are the different instruction set used in 8086?
6 major groups
1. Data transfer instruction.
(i). general purpose byte (or) word transfer instructions.
(ii) Special address transfer instruction.
(iii). Flag transfer instruction
(iv). Simple input and output port transfer instructions.
2. Arithmetic instruction
3. Bit manipulation instructions
4. String instruction
5. Program execution transfer instructions
6. Processor control instruction.

30. State the modes in which 8086 operate. (NOV/DEC 2004 CS).
The 8086 can operate in 2 modes and they are minimum (or) unprocessed mode and maximum (or) multiprocessor mode

31. State the functional units available in 8086. (NOV/DEC 2004 CS).
Divided into 2 separate functional units:
1. Bus interface unit (BIU)
2. Execution unit (EU)

32. Write about the privileged instructions?
An instruction which is reserved of use by a computer's operating system, which will determine the range of system resources that the user is allowed to exploit.

33. DEFINE PIPELINING
In 8086, to speedup the execution of program, the instructions fetching and execution of instructions are overlapped each other. This technique is known as pipelining. In pipelining, when the n th instruction is executed, the n+1 th instruction is fetched and thus the processing speed is increased.

34. WHAT IS THE PURPOSE OF SEGMENT REGISTERS IN 8086?
There are 4 segment registers present in 8086. They are
1. Code Segment (CS) register
2. Data Segment (DS) register
3. Stack Segment (SS) register
4. Extra Segment (ES) register

The code segment register gives the address of the current code segment. ie. It will points out where the instructions, to be executed, are stored in the memory.
The data segment register points out where the operands are stored in the memory.
The stack segment register points out the address of the current stack, which is used to store the temporary results.
If the amount of data used is more the Extra segment register points out where the large amount of data are stored in the memory.

35. DISCUSS THE FUNCTION OF INSTRUCTION QUEUE IN 8086?
In 8086, an 6 byte instruction queue is presented at the Bus Interface Unit(BIU). It is used to prefetch and store at the maximum of 6 bytes of instruction code from the memory. Due to this, overlapping instruction fetch with instruction execution increases the processing speed.

36. WHAT IS THE MAXIMUM MEMORY SIZE THAT CAN BE ADDRESSED BY 8086?
In 8086, an memory location is addressed by 20 bit address and the address bus is 20 bit address and the address bus is 20 bits. So it can address up to one mega byte(2^{20}) of memory space.

37. WHAT IS RECURSIVE PROCEDURES
A recursive procedure is a procedure which calls itself. Recursive procedures are used to work with complex data structures called trees. If the procedure is called with N=3, then the N is decremented by 1 after each procedure CALL and the procedure is called until N=0.

38. WHAT ARE LIBRARIES
Library files are collection of procedures that can be used in other programs. These procedures are assembled and compiled into a library file by the LIB program. The library file is invoked when a program is linked with linker program. when a library file is linked only the required procedures are copied into the program. Use of library files increase s/w reusability & reduce s/w development time.

39. WHAT ARE MACROS

Macro is a group of instruction. The macro assembler generates the code in the program each time where the macro is called. Macros are defined by MACRO & ENDM directives. Creating macro is similar to creating new opcodes that can be used in the program

INIT MACRO
MOV AX, data
MOV DS
MOV ES, AX
ENDM

40. HOW DO 8086 INTERRUPTS OCCUR

An 8086 interrupt can come from any of the following three sources
- External signals
- Special instructions in the program
- Condition produced by instruction

41. WHAT ARE THE 8086 INTERRUPT TYPES

Dedicated interrupts
- Type 0: Divide by zero interrupt
- Type 1: Single step interrupt
- Type 2: Non maskable interrupt
- Type 3: Breakpoint
- Type 4: Overflow interrupt

Software interrupts
- Type 0-255

42. WHAT IS INTERRUPT SERVICE ROUTINE

Interrupt means to break the sequence of operation. While the CPU is executing a program an interrupt breaks the normal sequence of execution of instructions & diverts its execution to some other program. This program to which the control is transferred is called the interrupt service routine.

43. DEFINE BIOS

The IBM PC has in its ROM a collection of routines, each of which perform some specific function such as reading a character from keyboard, writing character to CRT. This collection of routines is referred to as Basic Input Output System or BIOS.

44. EXPLAIN PUBLIC

For large programs several small modules are linked together. In order that the modules link together correctly any variable name or label referred to in other modules must be declared public in the module where it is defined. The PUBLIC directive is used to tell the assembler that a specified name or label will be accessed from other modules. Format PUBLIC Symbol.

45. EXPLAIN DUP

The DUP directive can be used to initialize several locations & to assign values to these locations. Format Name Data_Type Num DUP (value)

Example TABLE DW 10 DUP (0). Reserves an array of 10 words of memory and initializes all 10 words with 0. array name is TABLE.

46. EXPLAIN THE PROCESS CONTROL INSTRUCTIONS

STC – It sets the carry flag & does not affect any other flag

CLC – it resets the carry flag to zero &does not affect any other flag

CMC – It complements the carry flag & does not affect any other flag

STD – It sets the direction flag to 1 so that SI and/or DI can be decremented automatically after execution of string instruction & does not affect other flags

CLD – It resets the direction flag to 0 so that SI and/or DI can be incremented automatically after execution of string instruction & does not affect other flags

STI – Sets the interrupt flag to 1. Enables INTR of 8086.

CLI – Resets the interrupt flagto0. 8086 will not respond to INTR.

47.EXPLAIN REPEAT-UNTIL STATEMENTS

REPEAT-UNTIL statements allow to execute a series of instructions repeatedly until some condition occurs. The REPEAT defines the start of the loop & UNTIL the end of the loop. UNTIL has a condition when the condition is true the loop is terminated

48.COMPARE PROCEDURE & MACRO

Procedure	Macro
Accessed by CALL & RET instruction during program execution	Accessed during assembly with name given to macro when defined
Machine code for instruction is put only once in the memory	Machine code is generated for instruction each time when macro is called
With procedures less memory is required	With macro more memory is required
Parameters can be passed in registers, memory locations or stack	Parameters passed as part of statement which calls macro

49.WHAT IS MULTIPROGRAMMING?

If more than one process is carried out at the same time, then it is know as multiprogramming. Another definition is the interleaving of CPU and I/O operations among several programs is called multiprogramming.

To improve the utilization of CPU and I/O devices, we are designing to process a set of independent programs concurrently by a single CPU. This technique is known as multiprogramming.

50. WHAT IS THE FUNCTION OF BHE SIGNAL IN 8086?

BHE signal means Bus High Enable signal. The BHE signal is made low when there is some read or write operation is carried out. I.e. whenever the data bus of the system is busy i.e. whenever there is some data transfer then the BHE signal is made low.

51.WHAT ARE THE PREDEFINED INTERRUPTS IN 8086?

The various predefined interrupts are,

DIVISION BY ZERO (type 0) Interrupt.

SINGLE STEP (type 1) Interrupt.

NONMASKABLE (type2) Interrupt.

BREAK POINT (type 3) Interrupt.

OVER FLOW (type 4) Interrupt.

52. WHAT ARE THE DIFFERENT FLAGS AVAILABLE IN STATUS

REGISTER OF 8086?

There are 6 one bit flags are present. They are,

AF- Auxiliary Carry Flag

CF-Carry Flag.

OF-Overflow Flag
SF-Sign Flag
PF- Parity Flag
ZF-Zero Flag

53. LIST THE VARIOUS ADDRESSING MODES PRESENT IN 8086?

There are 12 addressing modes present in 8086. They are,
(a) Register and immediate addressing modes
(1) Register addressing modes
(2) Immediate addressing mode
(b) Memory addressing modes.
(3) Direct addressing modes
(4) Register indirect addressing modes
(5) Based addressing modes
(6)Indexed addressing modes
(7) Based Indexed addressing modes
(8) String addressing modes
(c) I/O addressing modes
(9)Direct addressing mode
(10)Indirect addressing mode
 (11) Relative addressing mode
 (12) Implied addressing
mode

54. STATE THE SIGNIFICANCE OF LOCK SIGNAL IN 8086?

If 8086 is working at maximum mode, there are multiprocessors are present. If the system bus is given to a processor then the LOCK signal is made low. That means the system bus is busy and it cannot be given of any other processors. After the use of the system bus again the LOCK signal is made high. That means it is ready to give the system bus to any processor.

55. HOW SINGLE STEPPING CAN BE DONE IN 8086?

By setting the Trace Flag (TF) the 8086 goes to single-step mode. In this mode, after the execution of each instruction s 8086 generates an internal interrupt and by writing some interrupt service routine we can display the content of desired registers and memory locations. So it is useful for debugging the program

PART-B

1. Describe Intel 8086 Microprocessor Architecture

2. Describe any five addressing modes of 8086 with suitable examples.

3. Write a 8086 ALP to convert an 8 bit binary number into equivalent gray code.

4. Explain the function of all the pins of 8086 Processor.

5. Write a 8086 ALP to sort an array of ten bytes in ascending order. Add comments to your Program.

6. Explain the function of various flags of 8086 microprocessor.

7. Explain the function of unsigned multiplication and Division instructions in 8086 with suitable examples.

8. Describe the functional units present and their functions in BIU and EU of 8086.

9. Write 8086 assembly language program to perform the following

a. To move a string of words from offset 1000h to offset 6000h. The
Length of the string is 0Ch.

b. To add an array of bytes. The array contains 50bytes.

UNIT-2
8086 SYSTEM BUS STRUCTURE

1. What is meant by key bouncing?
Microprocessor must wait until the key reach to a steady state; this is known as
Key bounce.

2. Write the function of crossbar switch?
The crossbar switch provides the inter connection paths between the memory
module and the processor. Each node of the crossbar represents a bus switch. All
these nodes may be controlled by one of these processors or by a separate one
altogether.

3. What is a data amplifier?
Transceivers are the bi-directional buffers are some times they are called as data
amplifiers. They are required to separate the valid data from the time multiplexed
address data signal. They are controlled by 2 signals
i.e DEN & DT/R.

4.What are the different inter connection topologies?
Shared bus □
Multiport Memory □
Linked Input/Output □
Bus window □
Crossbar Switching. □

5. What are the configurations used for physical interconnections?
Star Configuration □
Loop configuration □
Complete interconnection □
Regular topologies □
Irregular topologies □

6. Give the instruction set of 8087?
1. Data Transfer Instructions
2. Arithmetic Instructions
3. Comparison Instructions.
4. Transcendental Operations.
5. Constant Operations.
6. Coprocessor Control Operations.

7.Write the advantages of loosely coupled system over tightly coupled systems?

1. More number of CPUs can be added in a loosely coupled system to improve the system performance

2. The system structure is modular and hence easy to maintain and troubleshoot.

3. A fault in a single module does not lead to a complete system breakdown.

8. What is the different clock frequencies used in 80286?

Various versions of 80286 are available that run on 12.5MHz, 10MHz and 8MHz clock frequencies.

9. Define swapping in?

The portion of a program is required for execution by the CPU, it is fetched from the secondary memory and placed in the physical memory. This is called 'swapping in' of the program.

10. What are the different operating modes used in 80286?

The 80286 works in two operating modes

1. Real addressing mode

2. Protected virtual address mode.

11. What are the CPU contents used in 80286?

The 80286 CPU contains almost the same set of registers, as in 8086

Eight 16-bit general purpose register □

Four 16-bit segment registers □

Status and control register □

Instruction pointer. □

12. What is status flag bit?

The flag register reflects the results of logical and arithmetic instructions. The flag register digits D0, D2, D4, D6, D7 and D11 are modified according to the result of the execution of logical and arithmetic instruction. These are called as status flag bits.

13 What is a control flag?

The bits D8 and D9 namely, trap flag (TF) and interrupt flag (IF) bits, are used for controlling machine operation and thus they are called control flags.

14. What is instruction pipelining?

Major function of the bus unit is to fetch instruction bytes from the memory. In fact, the instructions are fetched in advance and stored in a queue to enable faster execution of the instructions. This concept is known as instruction pipelining.

15. What are the status register in 8087?

16.What is infinity control in 8089?

INFINITY CONTROL

0 = Projective

1 = Affine

□RC –Rounding control determines the type of rounding

17. What is rounding control in 8089?

ROUNDING CONTROL?

00=Round to nearest or even

01=Round down towards minus infinity

10=Round up towards plus infinity

11=Chop or truncate towards zero

☐PC- Precision control sets the precision of he result as define in table

18.What is control register in 8087?

19.What is XFER in 8087?

The XFER (transfer) instruction prepares the channel for a DMA transfer. It suspends program execution and enters the DMA transfer mode, using the channel registers setup by the program before executing the XFER instruction.

20 . What are the transfer made?

transfers may be made:

- from memory to I/O device;
- from I/O device to memory;
- from memory to memory;
- from I/O device to I/O device.
-

PART-B

1. Explain in detail about the different types of coprocessor configurations.

2. Explain briefly about loosely Coupled Configuration.

3. Explain briefly about tightly coupled configuration.

4. Explain in detail with an example about the various data types.

5. Describe in detail about the Architecture of 8089 I/O Processor.

6. Describe the different techniques in which how CPU can communicate with IOP.

7. Explain the difference between data processor and IO processor.

UNIT-3
I/O INTERFACING

1. What is the use of 8251 chip?

Intel's 8251A is a universal synchronous asynchronous receiver and transmitter compatible with Intel's Processors. This may be programmed to operate in any of the serial communication modes built into it. This chip converts the parallel data into a serial stream of bits suitable for serial transmission. It is also able to receive a serial stream of bits and converts it into parallel data bytes to be read by a microprocessor.

2.What are the different types of methods used for data transmission?

The data transmission between two points involves unidirectional or bi-directional transmission of meaningful digital data through a medium. There are basically there modes of data transmission

(a) Simplex

(b) Duplex

(c) Half Duplex

In simplex mode, data is transmitted only in one direction over a single communication

channel.For example, a computer (CPU) may transmit data for a CRT display unit in this mode.

In duplex mode, data may be transferred between two transreceivers in both directions simultaneously.

In half duplex mode, on the other hand, data transmission may take pace in either direction, but at a time data may be transmitted only in one direction. For example, a computer may communicate with a terminal in this mode. When the terminal sends data (i.e. terminal is sender). The message is received by the computer (i.e the computer is receiver). However, it is not possible to transmit data from the computer to terminal and from terminal to the computer simultaneously.

3.What are the various programmed data transfer methods?
ii) Synchronous data transfer
iii) Asynchronous data transfer
iv) Interrupt driven data transfer

4. What is synchronous data transfer?
It is a data method which is used when the I/O device and the microprocessor match in speed. To transfer a data to or from the device, the user program issues a suitable instruction addressing the device. The data transfer is completed at the end of the execution of this instruction.

5. What is asynchronous data transfer?
It is a data transfer method which is used when the speed of an I/O device does not match with the speed of the microprocessor. Asynchronous data transfer is also called as Handshaking.

6. What are the functional types used in control words of 8251a?
The control words of 8251A are divided into two functional types.
1. Mode Instruction control word
2. Command Instruction control word
Mode Instruction control word :-This defines the general operational characteristics of 8251A.
Command Instruction control word:-The command instruction controls the actual operations of the selected format like enable transmit/receive, error reset and modem control.

7. What are the basic modes of operation of 8255?
There are two basic modes of operation of 8255, viz.
1. I/O mode.
3. BSR mode.
In I/O mode, the 8255 ports work as programmable I/O ports, while
In BSR mode only port C (PC0-PC7) can be used to set or reset its individual port bits. Under the IO mode of operation, further there are three modes of operation of 8 255, So as to support different types of applications, viz. mode 0, mode 1 and mode 2.
Mode 0 - Basic I/O mode
Mode 1 - Strobed I/O mode
Mode 2 - Strobed bi-directional I/O

8. Write the features of mode 0 in 8255?
1. Two 8-bit ports (port A and port B) and two 4-bit ports (port C upper and lower) are available. The two 4-bit ports can be combined used as a third 8-bit port.
2. Any port can be used as an input or output port.
3.Output ports are latched. Input ports are not latched.
4. A maximum of four ports are available so that overall 16 I/O configurations are possible.

9. What are the features used mode 1 in 8255?
Two groups – group A and group B are available for strobed data transfer.
1. Each group contains one 8-bit data I/O port and one 4-bit control/data port.
2. The 8-bit data port can be either used as input or output port. The inputs and outputs both are latched.
3. Out of 8-bit port C, PC0-PC2 is used to generate control signals for port B and PC3=PC5 are used to generate control signals for port A. The lines PC6, PC7 may be used as independent data lines.

10. What are the signals used in input control signal & output control signal?
Input control signal
STB (Strobe input)
IBF (Input buffer full)
INTR(Interrupt request)
Output control signal
OBF (Output buffer full)
ACK (Acknowledge input)
INTR(Interrupt request)

11. What are the features used mode 2 in 8255?
The single 8-bit port in-group A is available.
1. The 8-bit port is bi-directional and additionally a 5-bit control port is available.
2. Three I/O lines are available at port C, viz PC2-PC0.
3. Inputs and outputs are both latched.
4. The 5-bit control port C (PC3=PC7) is used for generating/accepting handshake signals for the 8-bit data transfer on port A.

12. What are the modes of operations used in 8253?
Each of the three counters of 8253 can be operated in one of the following
six modes of operation.
1. Mode 0 (Interrupt on terminal count)
2. Mode 1 (Programmable monoshot)
3. Mode 2 (Rate generator)
4. Mode 3 (Square wave generator)
5. Mode 4 (Software triggered strobe)
6. Mode 5 (Hardware triggered strobe)

13. What are the different types of write operations used in 8253?
There are two types of write operations in 8253
(1) Writing a control word register
(2) Writing a count value into a count register
The control word register accepts data from the data buffer and initializes
the counters, as required. The control word register contents are used for
(a) Initializing the operating modes (mode 0-mode4)
(b) Selection of counters (counter 0- counter 2)
(c) Choosing binary /BCD counters
(d) Loading of the counter registers.
The mode control register is a write only register and the CPU cannot read
its contents.

14. Give the different types of command words used in 8259a?
The command words of 8259A are classified in two groups
1. Initialization command words (ICWs)
2. Operation command words (OCWs)
105. Give the operating modes of 8259a?
(a) Fully Nested Mode
(b) End of Interrupt (EOI)
(c) Automatic Rotation
(d) Automatic EOI Mode
(e) Specific Rotation
(f) Special Mask Mode
(g) Edge and level Triggered Mode
(h) Reading 8259 Status
(i) Poll command
(j) Special Fully Nested Mode
(k) Buffered mode
(l) Cascade mode

16. Define scan counter?
The scan counter has two modes to scan the key matrix and refresh the display. In
the encoded mode, the counter provides binary count that is to be externally
decoded to provide the scan lines for keyboard and display. In the decoded scan
mode, the counter internally decodes the least significant 2 bits and provides a
decoded 1 out of 4 scan on SL0-SL3.The keyboard and display both are in the
same mode at a time.

17. What is the output modes used in 8279?
8279 provides two output modes for selecting the display options.
1.Display Scan
In this mode, 8279 provides 8 or 16 character-multiplexed displays those
can be organized as dual 4-bit or single 8-bit display units.
2.Display Entry
8279 allows options for data entry on the displays. The display data is

entered for display from the right side or from the left side.

18. What are the modes used in keyboard modes?
1. Scanned Keyboard mode with 2 Key Lockout.
2. Scanned Keyboard with N-key Rollover.
3. Scanned Keyboard special Error Mode.
4. Sensor Matrix Mode.

19. What are the modes used in display modes?
1. Left Entry mode
In the left entry mode, the data is entered from the left side of the display
unit..
2. Right Entry Mode
In the right entry mode, the first entry to be displayed is entered on the
rightmost display.

20. What is the use of modem control unit in 8251?
The modem control unit handles the modem handshake signals to coordinate the
communication between the modem and the USART.

21. Give the register organization of 8257?
The 8257 perform the DMA operation over four independent DMA channels.
Each of the four channels of 8257 has a pair of two 16-bit registers. DMA address
register and terminal count register. Also, there are two common registers for all
the channels; namely, mode set registers and status register. Thus there are a total
of ten registers. The CPU selects one of these ten registers using address lines A0-
A3.

22. What is the function of DMA address register?
Each DMA channel has one DMA address register. The function of this register is
to store the address of the starting memory location, which will be accessed by the
DMA channel. Thus the starting address of the memory block that will be
accessed by the device is first loaded in the DMA address register of the channel.
Naturally, the device that wants to transfer data over a DMA channel, will access
the block of memory with the starting address stored in the DMA Address
Register.

23. What is the use of terminal count register?
Each of the four DMA channels of 8257 has one terminal count register. This
16-bit register is used for ascertaining that the data transfer through a DMA
channel ceases or stops after the required number of DMA cycles.

24. What is the function of mode set register in 8257?
The mode set register is used for programming the 8257 as per the requirements
of the system. The function of the mode set register is to enable the DMA
channels individually and also to set the various modes of operation.

25. List the operation modes of 8255
a) I.O Mode
i. Mode 0-Simple Input/Output.
ii. Mode 1-Strobed Input/Output (Handshake mode)
iii. Mode 2-Strobed bidirectional mode
b) Bit Set/Reset Mode.

26. What is a control word?
It is a word stored in a register (control register) used to control the operation of a
program digital device.

27. What is the purpose of control word written to control register in 8255?
The control words written to control register specify an I/O function for each
I.O port. The bit D7 of the control word determines either the I/O function of the
BSR function.
28.What is the size of ports in 8255?
Port-A : 8-bits
Port-B : 8-bits
Port-CU : 4-bits
Port-CL : 4-bits
29. What is interfacing?
An interface is a shared boundary between the devices which involves sharing
information. Interfacing is the process of making two different systems communicate
with each other.
30. What is memory mapping?
The assignment of memory addresses to various registers in a memory chip is
called as memory mapping.
31. What is I/O mapping?
The assignment of addresses to various I/O devices in the memory chip is
called as I/O mapping.
32. What is an USART?
USART stands for universal synchronous/Asynchronous Receiver/
Transmitter. It is a programmable communication interface that can communicate by
using either synchronous or asynchronous serial data.
33.What is the use of 8251 chip?
8251 chip is mainly used as the asynchronous serial interface between the
processor and the external equipment.
34. The 8279 is a programmable _____ interface.
Keyboard/Display
35 List the major components of the keyboard/Display interface.
a. Keyboard section
b. Scan section
c. Display section
d. CPU interface section

36. What is Key bouncing?
Mechanical switches are used as keys in most of the keyboards. When a key is pressed the contact bounce back and forth and settle down only after a small time delay (about 20ms). Even though a key is actuated once, it will appear to have been actuated several times. This problem is called Key Bouncing.

37. Define HRQ?
The hold request output requests the access of the system bus. In non- cascaded 8257 systems, this is connected with HOLD pin of CPU. In cascade mode, this pin of a slave is connected with a DRQ input line of the master 8257, while that of the master is connected with HOLD input of the CPU.

38. What is the use of stepper motor?
A stepper motor is a device used to obtain an accurate position control of rotating shafts. A stepper motor employs rotation of its shaft in terms of steps, rather than continuous rotation as in case of AC or DC motor.

39. What is TXD?
TXD- Transmitter Data Output
This output pin carries serial stream of the transmitted data bits along with other information like start bit, stop bits and priority bit.

40. What is RXD?
RXD- Receive Data Input
This input pin of 8251A receives a composite stream of the data to be received by 8251A.

41. Draw the status word format for 8254.
OUT
NULL
COUNT
RW1 RW0 M2 M1 M0 BCD

PART-B

1. With a neat block diagram, explain in detail the internal architecture of 8255 and its registers

2. Discuss how memory chips and I/O devices are interfaced to a microprocessor.

3. Explain the block diagram of the 8279 Keyboard/Display interface and its operations.

4. Draw a timing diagram to interface a 4K ROM and a 2K RAM consecutively with microprocessor 8085, starting with ROM interfacing at address 0000 H. Explain.

5. Discuss various Addressing modes of 8085 with suitable examples.

6. What are the various types of Data formats?Explain with examples.

7. Explain five interrupt inputs of 8085 with priority.

8. What are Hardware and Software Interrrupts?What is ISS?

9. Draw a diagram to interface a 6K ROM and a 2K RAM consecutively with microprocessor 8085, starting with ROM interfacing at address 8000 H.

10. What is Interrupt ?Explain enabling,disabling and masking of interrupts with examples.How to transfer data using interrupts.

11. Expailn how to use an RST instruction to implement a software breakpoint.

12. Explain an interrupt process and the difference between a maskable and non-maskable interrupt by using examples.

13. Interface a 10 or 12-bit D/A converter with an 8-bit microprocessor.

14. Design a circuit to interface an 8-bit D/A conveter with an 8-bit microprocessor and verify the analog output for a digital signal.

15. . Explain the block diagram of the 8155 I/O section and timer.

16. .Explain the function of Handshake signals.What is the difference between setting the 8155 I/O ports in ALT 1 and ALT 3.

17. Design a five-minute clock(timer using the 8254 and the interrupt technique. Display minutes and seconds.

18. Explain how the 8237 DMA controller transfers 64K bytes of data per channel with eight address lines.

19. Specify handshaking signals and their functions if port A of 8255 is set-up as input port in mode 1.

20. .explain mode 0 and mode 1 of 8253.

21. Explain terms synchronous,baud rate,parity,half and full duplex transmission.

22. Explain how data bits are transmitted in the asynchronous format,and calculate the the delay required between two successive bits for a given baud.

23. Explain the block diagram and the functions of each block of the 8251 USART (Programmable Communication Interface).

24. Write a short note on the following:

a) machine cycle

b) instruction cycle

c) execute cycle

d) Vectored interrupt

25. Interface a 8K RAM consecutively with microprocessor 8085, starting with ROM interfacing at address 8000 H.

26. Define Addresing modes,Data formats with examples.

27.Describe a scheme to demultiplex the multiplexed AD0-AD7 bus of 8085CPU.

28. Set up the 8255 I/O ports in the simple I/O and Bit Set/Reset(BSR) mode

29. Explain . the process of the Direct Memory Acess(DMA) and the functions of various elements of the 8237.

30. Expain the procedure of interfacing the temperature monitoring system with 8085.

4. MICROCONTROLLER & 5. INTERFACING MICROCONTROLLER

1. What is mean by microcontroller?

A device which contains the microprocessor with integrated peripherals like memory, serial ports, parallel ports, timer/counter, interrupt controller, data acquisition interfaces like ADC,DAC is called microcontroller.

2. Explain DJNZ instructions of intel 8051 microcontroller?

a) DJNZ Rn, rel

Decrement the content of the register Rn and jump if not zero.

b) DJNZ direct , rel

Decrement the content of direct 8-bit address and jump if not zero.

3. Write a program using 8051 assembly language to change the date 55H
stored in the lower byte of the data pointer register to AAH using rotate instruction.

MOV DPL,#55H

MOV A, DPL

RL A

Label :SJMP label

4 Give the alternate functions for the port pins of port3?

RD – Read data control output.

WR – Write data control output.

T1 – Timer / Counter1 external input or test pin.

T0 – Timer / Counter0 external input or test pin.

INT1- Interrupt 1 input pin.

INT 0 – Interrupt 0 input pin.

TXD – Transmit data pin for serial port in UART mode.

RXD - Receive data pin for serial port in UART mode.

5 Specify the single instruction, which clears the most significant bit of B
register of 8051, without affecting the remaining bits.

Single instruction, which clears the most significant bit of B register of 8051, without affecting the remaining bits is CLR B.7.

6. Explain the function of the pins PSEN and EA of 8051.

PSEN: PSEN stands for program store enable. In 8051 based system in which an external ROM holds the program code, this pin is connected to the OE pin of the ROM.

EA :EA stands for external access. When the EA pin is connected to Vcc, program fetched to addresses 0000H through 0FFFH are directed to the internal ROM and program fetches to addresses 1000H through FFFFH are directed to external ROM/EPROM. When the EA pin is grounded, all addresses fetched by program are directed to the external ROM/EPROM.

7. Explain the 16-bit registers DPTR and SP of 8051.

DPTR:

DPTR stands for data pointer. DPTR consists of a high byte (DPH) and a low byte (DPL). Its function is to hold a 16-bit address. It may be manipulated as a 16-bit data register or as two independent 8-bit registers. It serves as a base register in indirect jumps, lookup table instructions and external data transfer.

SP:
SP stands for stack pointer. SP is a 8- bit wide register. It is incremented before data is stored during PUSH and CALL instructions. The stack array can reside anywhere in on-chip RAM. The stack pointer is initialised to 07H after a reset. This causes the stack to begin at location
08H.

8 Name the special functions registers available in 8051.

Accumulator □
B Register □
Program Status Word. □
Stack Pointer. □
Data Pointer. □
Port 0 □
Port 1 □
Port 2 □
Port 3 □
Interrupt priority control register. □
Interrupt enable control register. □

9.Explain the register IE format of 8051.

EA- Enable all control bit.
ET2- Timer 2 interrupt enable bit.
ES – Enable serial port control bit.
ET1 – Enable Timer1 control bit.
EX1- Enable external interrupt1 control bit.
ET0 – Enable Timer0 control bit.
EX0- Enable external interrupt0 control bit.
.

10.Name the five interrupt sources of 8051?.

The interrupts are:
Vector address
External interrupt 0 : IE0 : 0003H □
Timer interrupt 0 : TF0 : 000BH □
External interrupt 1 : IE1 : 0013H □
Timer Interrupt 1 : TF1 : 001BH □
Serial Interrupt □
Receive interrupt : RI : 0023H
Transmit interrupt: TI : 0023H

11.Explain the contents of the accumulator after the execution of the following
program segments:
MOV A,#3CH
MOV R4,#66H
ANL A,R4
A 3C
R4 66
A 24

12. Write a program to load accumulator A, DPH and DPL with 30H.
MOV A,#30
MOV DPH,A
MOV DPL,A
13.Write a program to subtract the contents of R1 of Bank0 from the contents
of R0 of Bank2.
MOV PSW,#10
MOV A,R0
MOV PSW,#00
SUBB A,R1
14. How the RS -232C serial bus is interfaced to 1TL logic device?
The RS-232C signal voltage levels are not compatible with TTL logic
levels. Hence for interfacing TTL devices to RS-232C serial bus, level converters are
used. The popularly used level converters are MC 1488 & MC 1489 or MAX 232.
15. List some of the features of 8096 microcontroller.
a. The 8096 is a 16-bit microcontroller.
b. The 8096 is designed to use in applications which require high speed
calculations and fast I/O operations.
c. The high speed I/O section of an 8096 includes a 16-bit timer, a 16-bit
counter, a 4 input programmable edge detector, 4 software timers and
a 6-output programmable event generator.
d. It has 100 instructions, which can operate on bit, byte, word, and
double words.
e. The bit operations are possible and these can be performed on any bit
in the register file or in the special function register.
16. List the features of 8051 microcontroller?
The features are
*single_ supply +5 volt operation using HMOS technology.
*4096 bytes program memory on chip(not on 8031)
*128 data memory on chip.
*Four register banks.
*Two multiple mode,16-bit timer/counter.
*Extensive Boolean processing capabilities.
*64 KB external RAM size
*32 bi-directional individually addressable I/O lines.
*8 bit CPU optimized for control applications.
17. What is the function of NEU?
The numeric execution unit executes all the instructions including arithmetic,
logical transcendental, and data transfer instructions.
The numeric execution unit executes all the numeric processor instructions while
the control unit (CU) receives, decodes instructions, reads and writes memory
operands and executes the 8087 control instructions.
18. Give the disadvantages of bus window technique?
The numeric execution unit executes all the instructions including arithmetic,
logical transcendental, and data transfer instructions.
The numeric execution unit executes all the numeric processor instructions while

the control unit (CU) receives, decodes instructions, reads and writes memory operands and executes the 8087 control instructions.

19. What is swapping out?

A portion of the program or important partial results required for
further execution may e saved back on secondary storage to make the physical memory free for further execution of another required portion of the program. This is called 'swapping out' of the executable program.

20.List the features of 8051 microcontroller?

The features are
*single_supply +5 volt operation using HMOS technology.
*4096 bytes program memory on chip(not on 8031)
*128 data memory on chip.
*Four register banks.
*Two multiple mode,16-bit timer/counter.
*Extensive boolean processing capabilities.
*64 KB external RAM size
*32 bidirectional individually addressible I/O lines.
*8 bit CPU optimized for control applications.

21.Explain the operating mode0 of 8051 serial ports?

In this mode serial enters &exits through RXD, TXD outputs
the shift clock.8 bits are transmitted/received:8 data bits(LSB first).The baud rate is fixed at 1/12 the oscillator frequency.

22 Explain the operating mode2 of 8051 serial ports?

In this mode 11 bits are transmitted(through TXD)or received
(through RXD):a start bit(0), 8 data bits(LSB first),a programmable 9th data bit ,& a stop bit(1).ON transmit the 9th data bit (TB* in SCON)can be assigned the value of 0 or 1.Or for eg:, the parity bit(P, in the PSW)could be moved into TB8.On receive the 9th data bit go in to the RB8 in Special Function Register SCON, while the stop bit is ignored. The baud rate is programmable to either 1/32or1/64 the oscillator frequency.

23. Explain the mode3 of 8051 serial ports?

In this mode,11 bits are transmitted(through TXD)or
received(through RXD):a start bit(0), 8 data bits(LSB first),a programmable 9th data bit ,& a stop bit(1).In fact ,Mode3 is the same as Mode2 in all respects except the baud rate. The baud rate in Mode3 is variable.
In all the four modes, transmission is initiated by any instruction
that uses SBUF as a destination register. Reception is initiated in Mode0 by the condition RI=0&REN=1.Reception is initiated in other modes by the incoming start bit if REN=1.

24.Explain the interrupts of 8051 microcontroller?

The interrupts are:
Vector address

External interrupt 0 : IE0 : 0003H ☐
Timer interrupt 0 : TF0 : 000BH ☐
External interrupt 1 : IE1 : 0013H ☐
Timer Interrupt 1 : TF1 : 001BH ☐
Serial Interrupt ☐
Receive interrupt : RI : 0023H
Transmit interrupt: TI : 0023H

25.Write A program to perfom multiplication of 2 nos using 8051?
MOV A,#data 1
MOV B,#data 2
MUL AB
MOV DPTR,#5000
MOV @DPTR,A(lower value)
INC DPTR
MOV A,B
MOVX @ DPTR,A
26.Write a program to mask the 0th &7th bit using 8051?
MOV A,#data
ANL A,#81
MOV DPTR,#4500
MOVX @DPTR,A
LOOP SJMP LOOP

27.List the addressing modes of 8051?
Direct addressing ☐
Register addressing ☐
Register indirect addressing. ☐
Implicit addressing ☐
Immediate addressing ☐
Index addressing ☐
Bit addressing ☐
28.Write about CALL statement in 8051?
There are two subroutine CALL instructions. They are
*LCALL(Long CALL)
*ACALL(Absolute CALL)
Each increments the PC to the 1st byte of the instruction & pushes them
in to the stack.

29.Write about the jump statement?
There are three forms of jump. They are
LJMP(Long jump)-address 16
AJMP(Absolute Jump)-address 11
SJMP(Short Jump)-relative address

30.Write program to load accumulator ,DPH,&DPL using 8051?
MOV A,#30
MOV DPH,A
MOV DPL,A

31.Write a program to find the 2's complement using 8051?
MOV A,R0
CPL A
INC A

32.Write a program to add 2 8-bit numbers using 8051?
MOV A,#30H
ADD A,#50H
33.Write a program to swap two numbers using 8051?
MOV A, #data
SWAP A

34.Write a program to subtract 2 8-bit numbers &exchange the digits using
8051?
MOV A,#9F
MOV R0,#40
SUBB A,R0
SWAP A

35.Write a program to subtract the contents of R1 of Bank 0from the contents of R0 of Bank 2 using 8051?
MOV PSW,#10
MOV A,R0
MOV PSW,#00
SUBB A,R1

PART-B

1. Describe the architecture of 8051 with neat diagram. (16)

2. Discuss the peripheral interface of 8051. (8)

3. Explain the interrupt structure of 8051 microcontroller

4. Explain how interrupts are prioritized. (8)

5.What is the difference between the Microprocessorsand Microcontrollers?(8)

6.Explain the I/O port structure of 8051. (8)

7. Explain the different serial communication modes in 8051. (8)

8. Explain the memory structure of 8051. (8)

9. States various modes available for timer in 8051. (16)

10. Explain the functional pin diagram of 8051 Microcontroller. (16)