EC6504 MICROPROCESSOR AND MICROCONTROLLER

UNIVERSITY QUESTIONS

PART A

UNIT I THE 8086 MICROPROCESSOR

1. The offset address of a data is (341B)$_H$ and the data segment register value is (123A)$_H$. What is the physical address of the data? A/M17

Segment address = 123A$_H$ *10

$$= 1\ 2\ 3\ A\ 0\ _H$$

offset address   =   3 4 1 B $_H$

Physical address = 1 5 7 B B $_H$

----

2. Define stack register. A/M17, M/J16

The stack is a group of memory locations in the R/W memory that is used for temporary storage of binary information during the execution of a program. It is a LIFO data segment. Stack Segment Register (16 bit) is a 16 bit register that holds the base address of the 64KB of Stack Segment memory. Stack Pointer Register (16 bit) contains the 16 bit offset address which is added with the segment base address to produce physical address.

3. List the flags of 8086 N/D16, M/J16

8086 flag register format
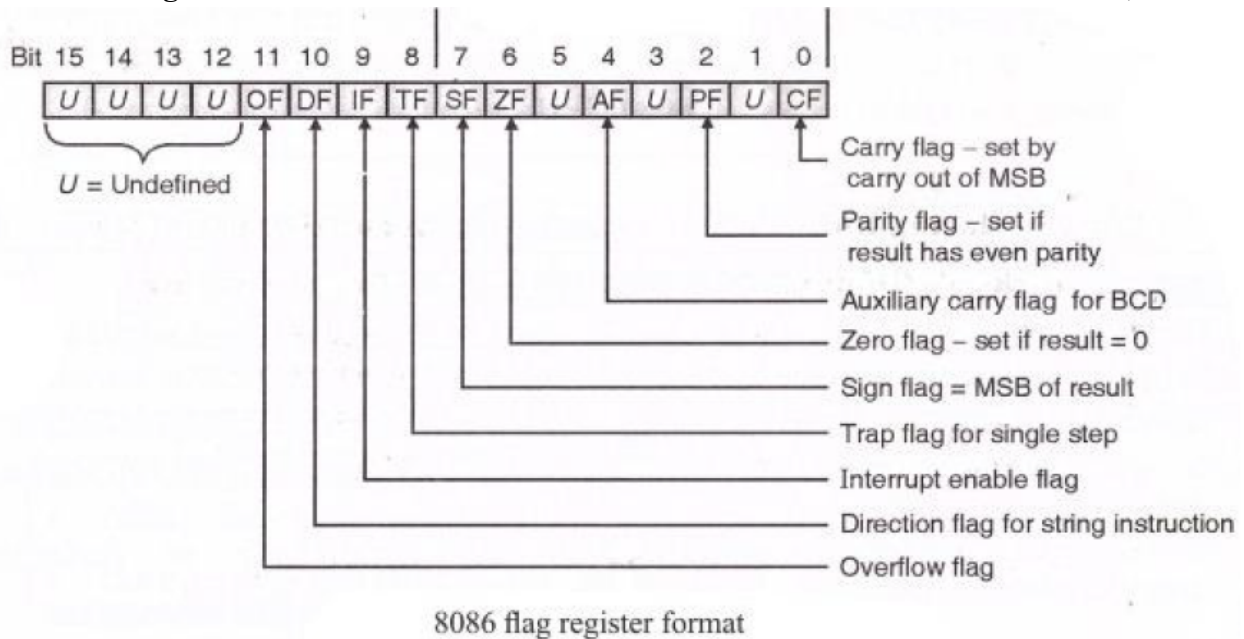
4.List the segment registers of 8086. N/D16

i. Code Segment Register (16 bit) – A 16 bit register that holds the base address of the 64KB of Code Segment memory.

EC6504 MICROPROCESSOR AND MICROCONTROLLER

UNIVERSITY QUESTIONS

PART A

ii. Data Segment Register (16 bit) - A 16 bit register that holds the base address of the 64KB of Data Segment memory.

iii. Stack Segment Register (16 bit) - A 16 bit register that holds the base address of the 64KB of Stack Segment memory.

iv. Extra Segment Register (16 bit) - A 16 bit register that holds the base address of the 64KB of Extra Segment memory.

5. Calculate the physical address, when segment address is 1085H and effective address is 4537H. N/D 15

Segment address - 1085H
Effective address - 4537H

Physical address – 14D87H
----

6. Show how the 2 byte INT instruction can be applied for debugging. N/D 15
INT type

The INT instruction is used as a debugging. The term *type* in the instruction format refers to a number between 0 and 255, which identify the interrupt. The INT 3 instruction is defined for use by debuggers to temporarily replace an instruction in a running program in order to set a breakpoint to identify run-time errors.

7. List the addressing modes of 8086. Give examples. A/M15

The different addressing modes are:
    i. Immediate addressing mode
    ii. Direct addressing mode
    iii. Register addressing mode
    iv. Register indirect addressing mode
    v. Base plus Index addressing mode
    vi. Register relative addressing mode
    vii. Base plus Index Register relative addressing mode
    viii. String addressing mode.

8. What are the 8086 interrupt types? A/M15

Dedicated hardware interrupts
    • Type 0: Divide by zero interrupt
    • Type 1: Single step interrupt
    • Type 2:Nonmaskable interrupt
    • Type 3: Breakpoint
    • Type 4: Overflow interrupt
Software interrupts: Type 0-255

EC6504 MICROPROCESSOR AND MICROCONTROLLER

UNIVERSITY QUESTIONS

PART A

9.List the modes of operation in 8086.   N/D17

The 8086 works in two operating modes
1. Minimum mode (or) Uniprocessor system (MN/MX =1).
2. Maximum mode (or) Multiprocessor system (MN/MX = 0).

10. Define macros.   N/D17

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

Example: INIT MACRO
           MOV AX, @data
           MOV DS
           MOV ES, AX
            ENDM

UNIT II 8086 SYSTEM BUS STRUCTURE

1.what is meant by multiprogramming?   A/M17, N/D15

Multiprogramming is the technique of running several processes at a time using times sharing. It allow a computer to do several things at the same time. Multiprogramming creates, logical parallelism. Multiprogramming improves the system performance by overlapping the I/o operation & CPU operation.

2. Write some example for advanced processors.   A/M17, N/D17

The 8087 Numeric Data Processor
The 8089 I/O processor
The 80286/80287, 80386, 80486 and Pentium processors.

3.Define machine cycle.   N/D16

It is defined as the time required to complete one operation i.e accessing either memory or IO device.

4. Define Bus.   N/D16

A set of conductors used for communicating information between the components in a computer system is called bus. Common buses are data bus, address bus and control bus.

5. Differentiate External vs internal bus.   M/J16

If a bus connects two minor components (control unit to the registers within the CPU) is called internal bus. When a bus connects two major components suach as CPU and interface, it is called an external bus.

6. Compare closely coupled and loosely coupled configurations.   N/D 11, M/J 16

Closely coupled	Loosely coupled
1. Single CPU is used	1. Multiple CPU modules are used
2. It has local bus only	2. It has local as well system bus
3. No system memory or IO	3. It has system memory and IO, shared
4. No bus arbitration logic required	4. Bus arbitration logic required among the CPU modes

7. Schematically show, how Synchronization is made between 8086 and its coprocessor N/D15

Figure 11-3 Synchronization between the 8086 and its coprocessor.
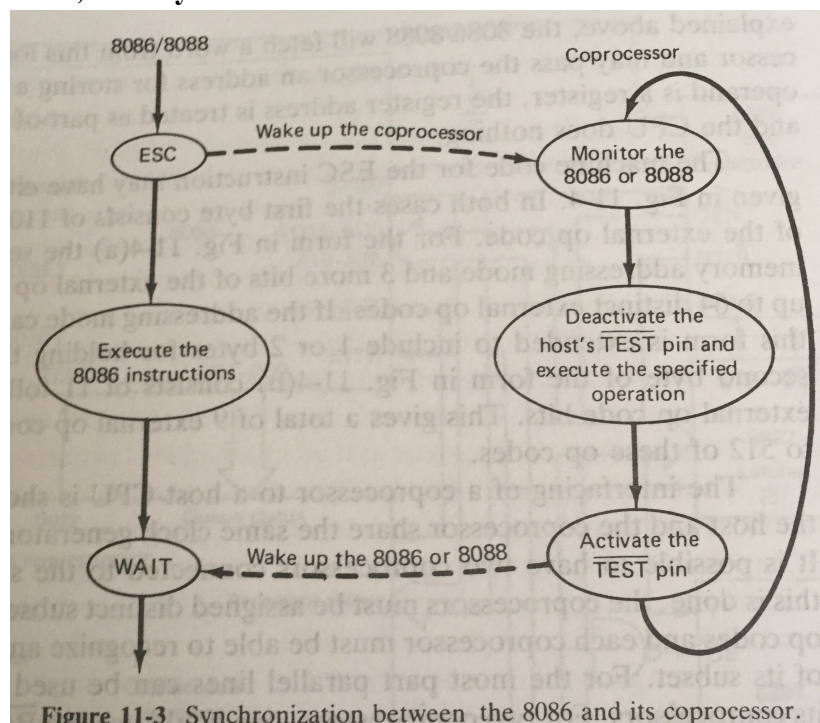
8. Define bus. Why bus request and cycle stealing are required.   A/M15

A set of conductors used for communicating information between the components in a computer system is called bus. The CPU with its bus control logic acts as master, the other components can gain control of the bus by sending a bus request to the CPU. After the current bus cycle is completed the CPU will return a bus grant signal and the component sending the request will become the master. Taking control of the bus for a bus cycle is called cycle stealing

9. Draw the read cycle timing diagram for minimum mode.   A/M15
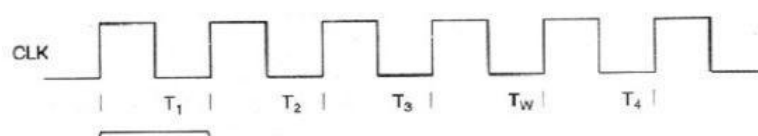
10. What is the need for the LOCK signal? N/D17.

LOCK: This signal indicates that an instruction with a LOCK prefix is being executed and thebus is not to be used by another processor.

UNIT III I/O INTERFACING

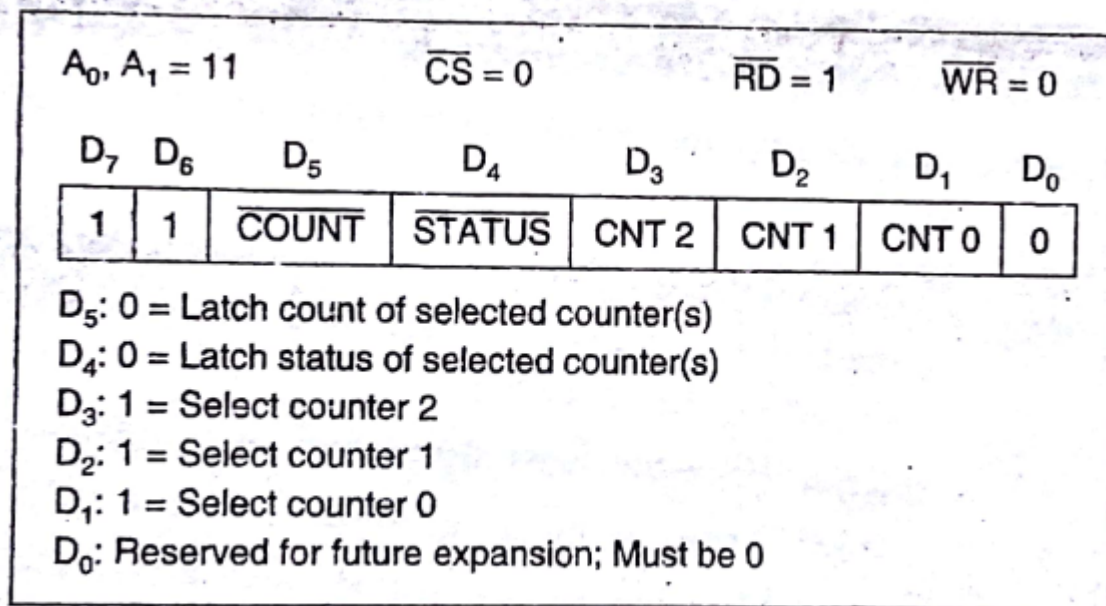**1. Draw the format of read back command register of 8254.** A/M 17

Figure 7.55 Read Back command format.

2. **Write a 16 bit delay program in 8086.** A/M 17.

```
        MOV BX, COUNT;
L1:     DEC BX
        NOP
        JNZ L1
        RET
```

3. What is keydebouncing? M/J 16

When the key is depressed and released, the contact is not broken permanently. In fact, the key makes and breaks the contacts several times for a few milliseconds before the contact is broken permanently.

4. What freq. transmit clock (Txc') is required by an 8251 in order for it to transmit data at 4800 baud with a baud rate factor of 16. N/D 15

T=

5. What is the drawback of memory mapped I/O? N/D 16

No control signal is available to differentiate the memory address and IO port address in the address bus. Hence there will be confusion between memory location and IO device having the same address and port number. The memory locations are sacrificed for IO device in order to overcome this problem

More hardware is required to decode 16 bit address.

6. What are the handshake signals used in Mode-2 configuration of 8255? N/D17.

input control signal:

     1.STB (strobe input)

     2.IBF (input buffer full)

     3. INTR (interrupt request)

output control signal:

     1.OBF (output buffer full)

     2. ACK (Acknowledge input)

     3.INTR (interrupt request)

7. How the DMA operation performed with 8086. N/D17.

     The direct memory access (DMA) I/O technique provides direct access to the memory while the microprocessor is temporarily disabled.

DMA Operations

➢ In idle state it does nothing.

➢ In active cycle, DMA transfer data in one of the four modes.

     1. Single Transfer mode.

     2. Block Transfer mode

     3. Demand or Burst Transfer mode

     4. Cascade mode.

8. Give the various modes and applications of 8254 timer? A/M15

     There are 6 modes of operation. They are

          1. Mode 0 (Interrupt on terminal count)

          2. Mode 1 (Programmable mono shot)

          3. Mode 2 (Rate generator)

          4. Mode 3 (Square wave generator)

          5. Mode 4 (Software triggered strobe)

          6. Mode 5 (Hardware triggered strobe)

Applications

Real time clock

Event-counter

Square wave generator

Binary rate multiplier

Complex waveform generator

Complex motor controller

9. List the advantages and disadvantages of parallel communication over serial communication. M/J16

| BASIS FOR COMPARISON	SERIAL TRANSMISSION	PARALLEL TRANSMISSION
Meaning	Data flows in bi-direction, bit by bit	Multiple lines are used to send data i.e. 8 bits or 1 byte at a time
Cost	Economical	Expensive
Bits transferred at 1 clock pulse	1 bit	8 bits or 1 byte
Speed	Slow	Fast
Applications	Used for long distance communication. Eg, Computer to computer	Short distance. Eg, computer to printer

10. Draw the block diagram of alarm controller with 8086. A/M15

EC6504 MICROPROCESSOR AND MICROCONTROLLER

UNIVERSITY QUESTIONS

PART A

UNIT IV MICROCONTROLLER
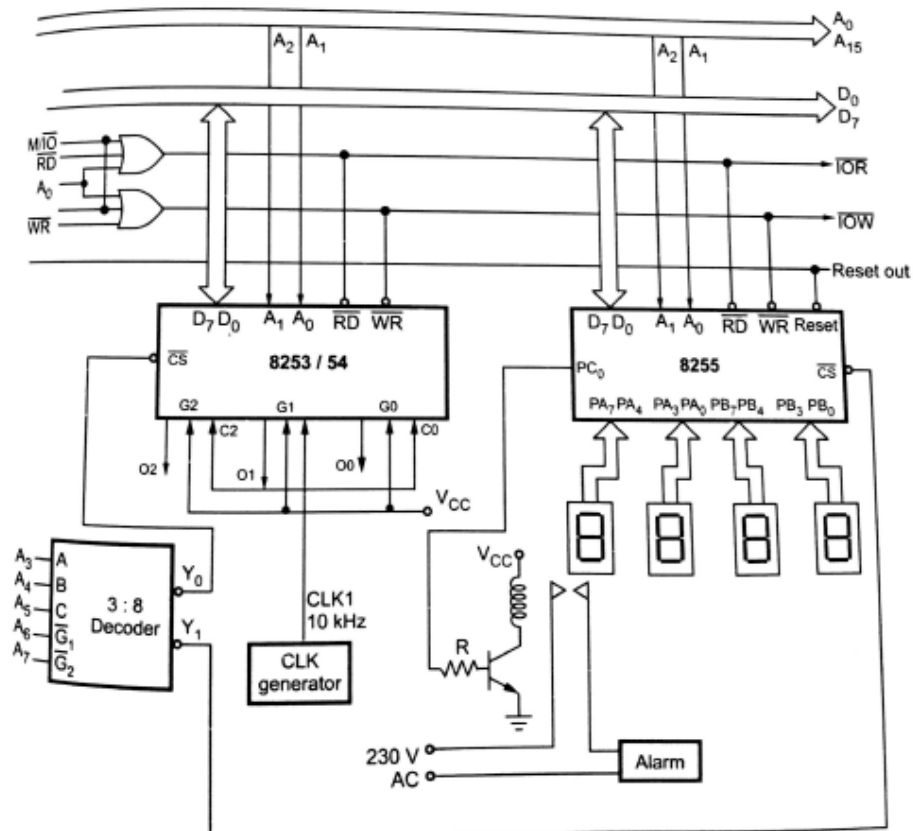
EC6504 MICROPROCESSOR AND MICROCONTROLLER

UNIVERSITY QUESTIONS

PART A

1. How to set 8051 in idle mode   **N/D17**

    Idle mode: In this mode, the oscillator continues to run and the interrupt, serial port and timerblocks are active, but the clock to the CPU is disabled. The CPU status is preserved. This mode can be terminated with a hardware interrupt or hardware reset signal. After this, the CPU resumes program execution from where it left off.

2. Illustrate the DJNZ instruction.   **N/D17**

    DJNZ <byte>, < rel – addr> (Decrement & jump if not zero)

The DJNZ decrements by 1 the contents of the location indicated & brancher to the address indicated by the second operand if the resulting value is not a zero. DJNZ Rn rel

3. Which port used as multifunction port? List the signals.   **A/M17**

    All port pins of ports 3 are multi functional. Therefore 1 each pin of ports can be programmed to use as I/o or as one of the alternate function.

Port Pin	Alternate Function
P3.0	RXD (serial input port)
P3.1	TXD (serial output port)
P3.2	$\overline{INT0}$ (external interrupt)
P3.3	$\overline{INT1}$ (external interrupt)
P3.4	T0 (Timer/Counter 0 external input)
P3.5	T1 (Timer/Counter 1 external input)
P3.6	$\overline{WR}$ (external data memory write strobe)
P3.7	$\overline{RD}$ (external data memory read strobe)

4. Illustrate the CJNZ instruction.   **A/M17**

Compare and Jump if Not Equal – CJNE

    CJNE < dest.byte>, <src.byte>, rel

    Compare the magnitude of the two operands and jump if they are not equal.

    Exa: **CJNE A1 direct rel**

5. What is the jump range?   **N/D15**

    AJMP addr11 (Absolute Jump) – Within 2K bytes of program memory.

    LJMP addr16 (Long Jump) -Within 64K bytes of program memory.

    SJMP Rel.addr (Short Jump) –128 to +127 of program memory.

6.What is the significance of EA pin?   **N/D16**

    EA stands for External Access

- If **EA=0**,
  - Microcontroller completely ignores internal program memory (4 KB) and executes only the program stored in external memory (64KB).
  - The 8051 access the external memory location starts from 0000H to FFFFH.
- If **EA=1**
  - microcontroller executes first the program from built-in ROM (4 KB), then the program stored in external memory.

The 8051 first access the internal ROM by start from 0000H to 0FFFH and then access the external memory from 1000H to FFFFH.

7. Draw the pin diagram of 8051.   **N/D16**
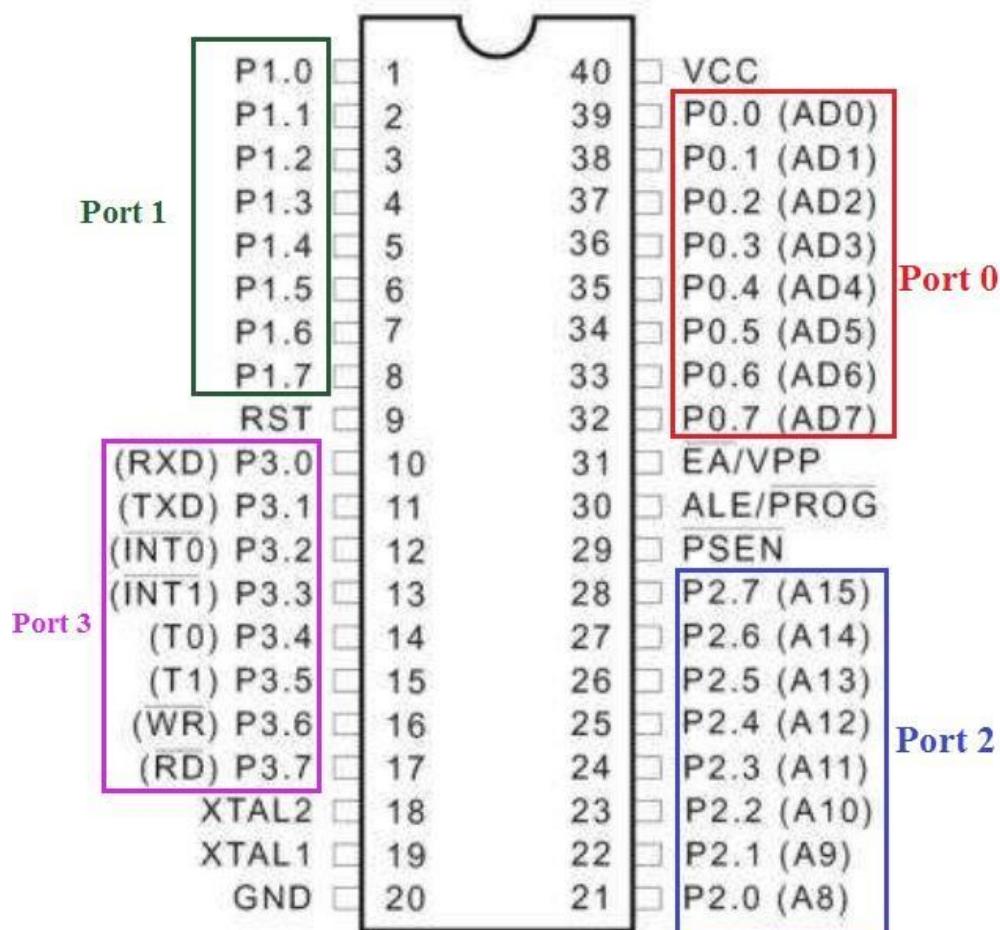
8. What are the different ways of operand addressing in 8051?   **M/J 16**

There are five addressing modes in 8051.They are

1. Direct addressing mode
2. Indirect addressing mode
3. Register addressing mode
4. Immediate addressing mode

5. ☏ Base plus Index register indirect addressing mode

9. Mention the number of register banks and their addresses in 8051.   **N/D15**

There are 4 register banks. They are Bank0, Bank1, Bank2& Bank3.

RAM locations from 00 to 07H for bank 0

RAM locations from 08 to 0FH for bank 1

RAM locations from 10 to 17H for bank 2

RAM locations from 18 to 1FH for bank 3

10. Draw the diagram of PSW in 8051. How do you select the register bank in 8051. A/M15
Program Status Word:

• Many instructions implicitly or explicitly affect (or are affected by) several status flags, which are grouped together to form the Program Status Word. • It also used to select the memory bank.

	B_7	B_6	B_5	B_4	B_3	B_2	B_1	B_0
	CY	AC	F0	RS1	RS0	OV	-	P

CY	Bit 7	-	Carry flag
AC	Bit 6	-	Auxiliary carry flag for BCD operations
F0	Bit 5	-	User defined flag (Flag zero)
RS1, RS0	Bit 4-3	-	Select the working register banks as follows :

RS1	RS0	BANK SELECTION	
0	0	00H - 07H	Bank 0
0	1	08H - 0FH	Bank 1
1	0	10H - 17H	Bank 2
1	1	18H - 1FH	Bank 3

Fig. 6.3 Program status word

OV	Bit 2	-	Overflow flag
—	Bit 1	-	Reserved
P	Bit 0	-	Parity flag (1 = Even parity)

UNIT V INTERFACING MICRO CONTROLLER

1. List the 8051 interrupts with its priority.   **N/D17, A/M17**

● 8051 provides 5 vectored interrupts. They are -

EC6504 MICROPROCESSOR AND MICROCONTROLLER

UNIVERSITY QUESTIONS

PART A

- External 0 Interrupt
- Timer 0 Interrupt
- External 1 Interrupt
- Timer 1 Interrupt
- Serial Interrupt

2. Give two examples of sensors and state its uses.   **N/D17,A/M17**

Temperature sensors (LM35, AD 590), light sensors and pressure sensors.

3. List the modes of timer in 8051.   **N/D16**

There are four operation modes

Timer Mode-0: (13-bit UP counter)

Timer Mode-1: (16-bit mode)

Timer Mode-2: (Auto reload mode)

Timer Mode-3: Split Mode (Two 8-bit counters)

4. Show how baud rate is calculated for serial data transfer in mode 1.   **N/D16**

Mode 1 has variable baud rate. The baud rate can be generated either by timer1 or timer 2.

Baud rate = (K* Oscillator frequency)/(32*12*[256-TH1])

if SMOD=0, K=1;

if SMOD=1, K=2;

5. Compare polling and interrupt.   **M/J 16**

In polling, the microcontroller continuously checks each port one by one according to the priority assigned to the ports, and if any device requires service, then it provides it. In interrupt, when the device requires service, it sends the request to microcontroller and the controller then provides service to it.

6. Define baud rate of 8051.   **M/J 16**

The rate of data transfer in serial data communication is stated in bps (bits per second).Another widely used terminology for bps is baud rate. It is modem terminology and is defined as the number of signal changes per second In modems, there are occasions when a single change of signal transfers several bits of data.

7. Mention the features of serial port in mode0.   **N/D15**

The Serial Port in Mode-0 has the following features:

Serial data enters and exits through RXD

TXD outputs the clock

8 bits are transmitted / received

The baud rate is fixed at (1/12) of the oscillator frequency.

8. How is A/D converter interfaced with 8051?   **N/D15**

The microprocessor starts the conversion process by sending the start of convert signal

(SOC) to the ADC. The ADC takes the analog input and converts it to digital. When the conversion is complete, the ADC outputs the end of conversion (EOC) signal to the microprocessor Then, the microprocessor reads the data present at the output of ADC.
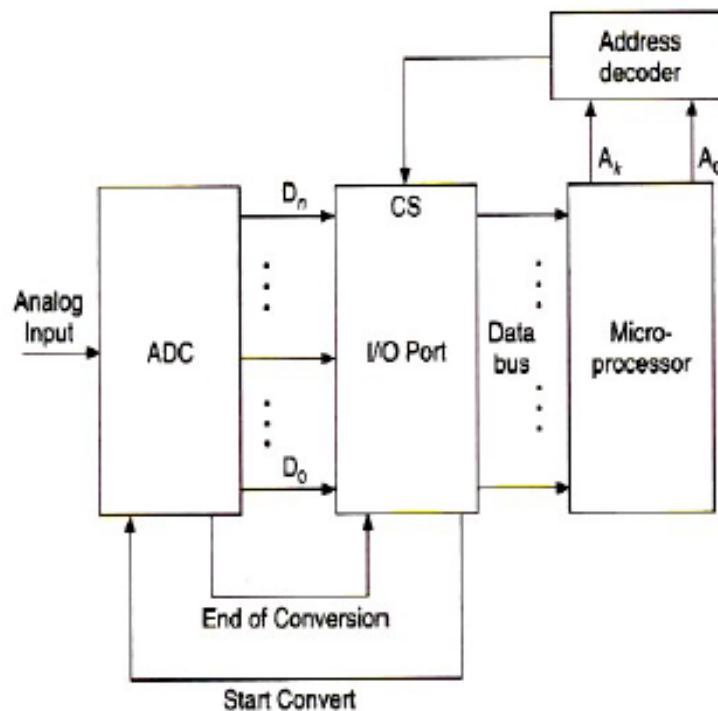

Figure Microprocessor interface to ADC(asynchronous mode)

9. Differentiate between timers and counter. N/D15

The 8031/8051 has two 16-bit programmable timer/counter namely timer-1 and timer 0 In the counter mode of operation they can count the number of high to low transitions of the signal applied to the timer pins. In timer mode of operation they can be independently programmed to work in any one of the four operation modes.

10. Which register is used for serial programming in 8051? N/D15

SBUF Register (Serial Buffer): SBUF is an 8-bit register for serial communication in 8051. The byte data to be transferred is framed with the start and stop bits and transferred serially via the TxD line.When the bits are received serially via RxD, the 8051 deframes it by eliminating the stop and start bits then placie the received byte in SBUF.

11. Draw the diagram of TCON in 8051. N/D15

TCON is bit addressable. It is partly related to Timer and partly to interrupt.

EC6504 MICROPROCESSOR AND MICROCONTROLLER
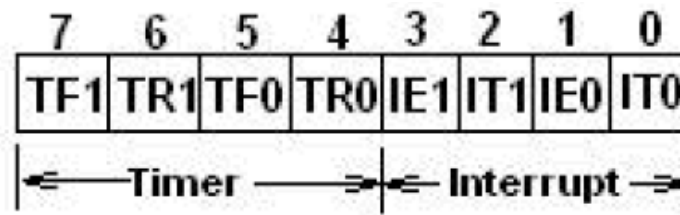
UNIVERSITY QUESTIONS

PART A

Figure: TCON Register

The various bits of TCON are as follows.

TF1 : Timer1 overflow flag.
TR1 : Timer1 run control bit.
TF0 : Timer0 overflow flag.
TR0 : Timer0 run control bit.
IE1 : Interrupt1 edge flag.
IE0 : Interrupt0 edge flag.
IT1 : Interrupt1 type control bit.
IT0 : Interrupt0 type control bit.