

- Q.1 State the important features of 8051 microcontroller
- Ans.
- 8051 microcontroller it consists 4 k byte ROM
  - 8051 microcontroller it consists 128 byte RAM
  - The 8051 microcontroller has a powerful CPU that can execute instruction at a clock speed
  - The 8051 microcontroller has two 16-bit timer / counters
  - microcontroller support both hardware & software interrupt
  - 8051 microcontroller has four 8-bit I/O ports
  - 8051 microcontroller has a low-power mode
  - 8051 microcontroller has a rich instruction set

- Q.2 Define the term Bus related to microcontroller and list different buses used in microcontroller

Ans. Bus is a group of wires which uses as a communication channel or acts as means of data transfer. The different bus configuration includes 8, 16 or more cables. Therefore a bus can bear 8 bits, 16 bits all together

8051 microcontroller has two types of buses i) address bus ii) data bus

• Address bus - 8051 microcontroller is consisting of 16-bit address bus it is generally be used for transferring the data from CPU to memory

• data bus - 8051 microcontroller is consisting of 8-bit data bus it is generally be used for transferring the data from one peripheral position to other peripherals



Q.3

List out any two instructions of following addressing mode  
i) immediate addressing ii) immediate register addressing  
iii) register addressing

Ans.

i) Immediate addressing -

- in this immediate addressing mode the data is provided in the instruction itself
- the data is provided immediately after the opcode

- $\text{MOV R3, } \# 43H$
- $\text{MOV DPTR, } \# 00H$

ii) Register addressing

- in the register addressing mode the source or destination data should be present in a register
- in this data store in general purpose register

- $\text{MOV R1, A}$
- $\text{MOV R0, R2} \rightarrow$  not allowed.

iii) immediate <sup>register</sup> addressing mode

Q.4

Draw format of SCON & SBUF special function register

ans

1) SCON - Serial control SFR is used to control serial port  
o o o o o o o o (value on reg4)

SCON	SM0	SM1	SM2	REN	TB8	RB8	TI	RI	address = 98H
	MSB					LSB			

Bit	Symbol	Description
7	SM0	Serial port mode selection bit 0
6	SM1	Serial port mode selection bit 1
5	SM2	multiprocessor comm. bit
4	REN	Receive enable bit
3	TB8	Transmitted bit 8
2	RB8	Received bit 8
1	TI	Transmit interrupt flag
0	RI	Receive interrupt flag

2) SBUF - The serial buffer or SBUF register is used to hold the serial data while transmission or reception

SBUF	x	x	x	x	x	x	x	x	(value on reg4)
	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0	address - 99H
	MSB					LSB			

Q.5 State The alternative function of port 0, port 1, port 2.

Ans Port 0 - • Port 0 is an 8-bit bidirectional I/O port it can be used for both input and output operations

- it has an internal pull-up resistor that can be enabled or disabled by software.
- it is often used for external memory interfacing

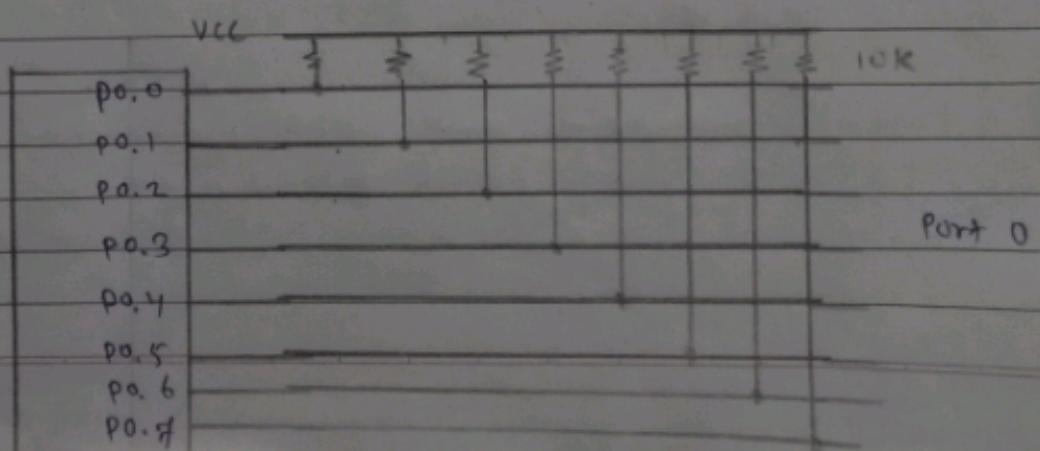
Port 1 - • P1 is also an 8-bit bidirectional I/O port

- it can be used for both input & output operations
- Port 1 pins have additional functions like timer/counter input, external interrupt input & serial communication signals.

Port 2 - • P2 is an 8-bit bidirectional I/O port it can be used for both input & output operation

- P2 pins are multiplexed with the high-order address bus & some control signals so it is often used for external memory

Port 0 pull up register -



Q.6 Explain The interrupts of 8051 microcontroller

ans  
• interrupts are the events that permanently suspend the main program pass the control to external source and executed their work it then passes the control to the main program where it had left off

• There are 5 interrupts in 8051 microcontroller.

- 1) Timer 0 overflow interrupt (TFO)
- 2) Timer 1 overflow interrupt (TF1)
- 3) External hardware interrupt (INT0) INT0
- 4) External hardware interrupt (INT1) INT1
- 5) serial communication interrupt (RT, TI)

in This -

- TFO, TF, & (RT, TI) are internal interrupt
- INT0, INT1, are external interrupt
- all are vector interrupt
- all are maskable interrupt

Q. 7

Draw and explain the pin configuration / diagram of 8051 microcontroller.

ans.

P1.0	1	40	VCC
P1.1	2	39	P0.0 (AD0)
P1.2	3	38	P0.1 (AD1)
P1.3	4	37	P0.2 (AD2)
P1.4	5	36	P0.3 (AD3)
P1.5	6	35	P0.4 (AD4)
P1.6	7	34	P0.5 (AD5)
P1.7	8	33	P0.6 (AD6)
RST	9	32	P0.7 (AD7)
(RXD) P3.0	10	31	EA / VPP
(TXD) P3.1	11	30	ALE / PROG
(INT0) P3.2	12	29	PSEN
(INT1) P3.3	13	28	P2.7 (A15)
(T0) P3.4	14	27	P2.6 (A14)
(T1) P3.5	15	26	P2.5 (A13)
(WR) P3.6	16	25	P2.4 (A12)
(RD) P3.7	17	24	P2.3 (A11)
XTA12	18	23	P2.2 (A10)
XTA11	19	22	P2.1 (A9)
CND	20	21	P2.0 (A8)

8051

- 1) Pin 1 to 8 - This pin known as port 1
- 2) Pin 9 - This is RESET pin which is used to reset the microcontroller to its initial value.
- 3) Pin 10 P0.17 - This pins known as port 3
- 4) Pin 18 & 19 - This pin used for to get system clock
- 5) Pin 20 - This pin used to provide power supply
- 6) Pin 21 to 28 - This pin known as port 2
- 7) Pin 29 - This is pin PSEN which stands for program store enable.
- 8) Pin 30 - This is pin ALE (address latch enable)
- 9) Pin 31 - this is pin EA ( External access )
- 10) Pin 32 to 39 - This pin known as port 0
- 11) Pin 40 - This pin used to power supply

Q.8

Explain the following example of each

- i) Logical instruction
- ii) Branching instruction
- iii) Data transfer instruction

ans.

1) Logical instruction - Logical instruction are used to perform logical operations like AND, OR, XOR, NOT. Logical instruction are performed on bytes of data on a bit-by-bit basis.

example - ANL A, #0x0F

ORL A, #0xF0

2) Branching instruction - These instruction control the flow of program logic. The branching instruction are following - LJMP, AJMP, SJMP, JZ, JNZ etc.

example - JZ label ; jump if accumulator is 0

JNZ label ; jump to label if the accumulator not 0

3) Data Transfer instruction - These instruction allow you to move data between register & memory load or store data in memory & manipulate stack.

example - MOV R0, R1 ; move content of R1 to R0  
XCHF A, R0 ; exchange the data of A with R0

Q.9 List different timer modes of 8051 microcontroller and describe mode 1 & 2

Ans. The 8051 microcontroller has four different timer mode.

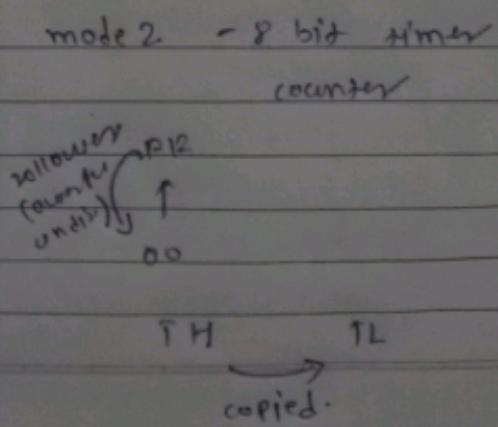
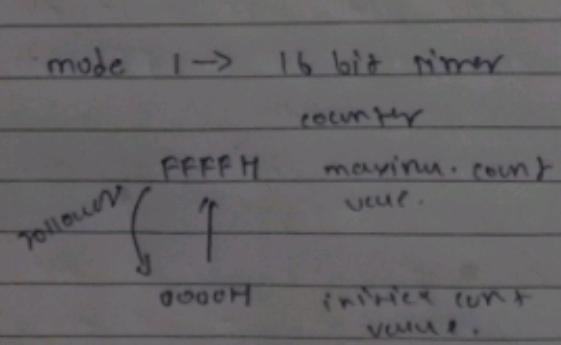
mode 0 - in this mode, timer 0 operate as a 13-bit timer it has a maximum count value of 8191 & generates interrupt when it overflow

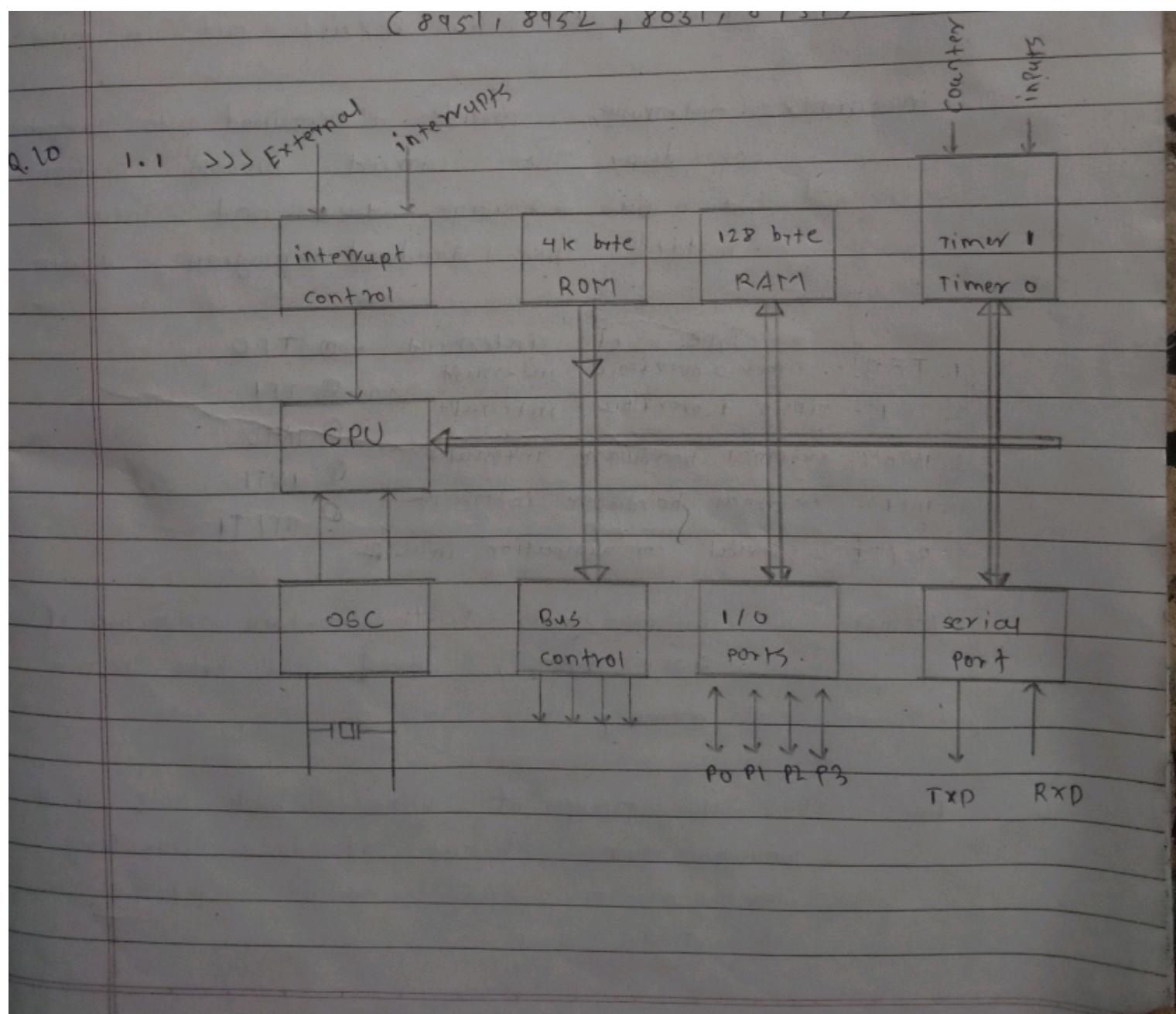
mode 1 - in this mode, timer 1 operate as a 16-bit timer, timer 1 generate an interrupt when it overflow

mode 2 - in this mode, timer 1 operates in 8-bit split mode. The high & low bytes of timer 1 are separated & modify separately.

mode 3 - in this mode, timer 0 & timer 1 operate in timer / counter mode both timer can be used as external event counter.

describ mode 1 & 2.  $\rightarrow$





## Explanation of microcontroller 8051

→ microcontroller 8051 contain is designed by intel in 1981 it is an 8-bit microcontroller it is built with 40 pins, 4 kb ROM, 128 bytes of RAM, 2 16 bit timer

CPU - CPU act as a mind of any processing machine it synchronizes and manages all processes that carried out in microcontroller.

interrupts - interrupts provide a method to postpone or delay the current process, performs a sub-routine task and then restart the standard program again

Type of interrupt -

- 1. TFO :- timer 0 overflow interrupt      ① TFO
- 2. TFI :- timer 1 overflow interrupt      ② TFI
- 3. INT0 :- external hardware interrupt      ③ INT0
- 4. INT1 :- external hardware interrupt      ④ INT1
- 5. RI/TI :- serial communication interrupt      ⑤ RI/TI

Memory - microcontroller 8051 contain 4 k byte of ROM memory and 128 byte ram memory

Bus - Bus is group of wire which used as a communication channel of data transfer

microcontroller 8051 contain address bus & data bus

OSC - As the microcontroller is digital circuit  
Therefore it needs timer for their  
operation to perform timer operation inside  
microcontroller it required externally  
connected or one-chip osc (oscillator)