Assignment No: 3

Que① Draw & Explain port structure of PIC 18 Microcontroller with different register used in programming.

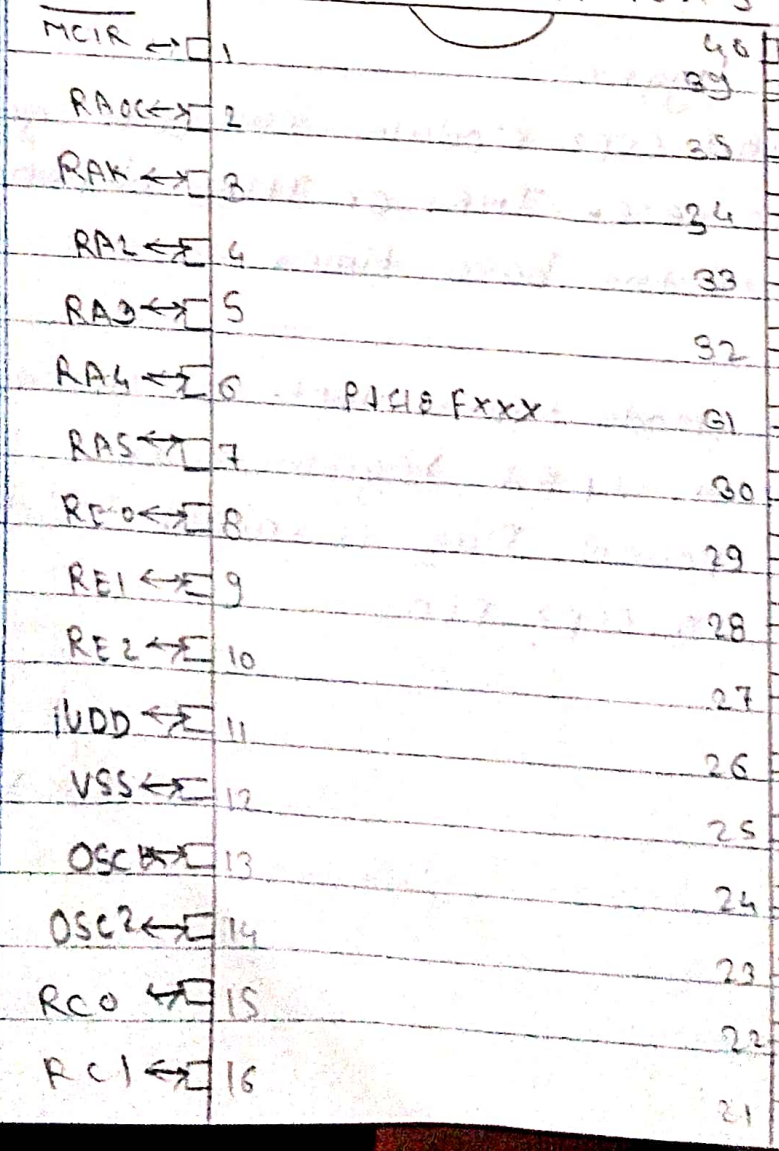
→

The PIC18 Microcontroller features multiple I/O devices that can be configured as digital unit of I/O pins.

The port are labeled as PORTA, PORTB, PORTC, PORTD, PORTE.

Making a total of 40 I/O pins.

Pin diagram of PORTS



1. TRISx (Tri - State Register):-

- TRISx (e.g. TRISA, TRISB) control diong each Pin on Port.
- Setting a bit in TRISx to 1 configures the corresponding pin as IIP & setting it to

2. PORTx (Port register):-

- PORTx (e.g. PORTA, PORTB) is used to read the status of input pins or write data to olp pins.
- Conen an pin is configured as o n olp coriting to PORTx sets. or clears.

3. LATx (latch Registra)

- LATx (e.g LATA, LATB movides a read-moding corite Operation for olp pins.
- conen, a pin is configured as an olp coriting to PORTx sets or clears.

4) ANSELx (Analog Select Register):-

- ANSELx (Analog A, ANSELB) controls whether pins can be used for analog Input as digital I1o.

- Setting a bit in ANSELx to 1 configures the corresponding pin as an analog input, while setting it to 0 configures it as a digital I/O.

- These registers allow you to configure & control the behaviour the I/O pins on a pic 18 microntroller for various applications.

Que ② Write a short note on interfacing of 16 LCD in 4-bit Mode operation.

→ LCD Displays are widely used because of its low current consumption as compared to SSD. Also that LCD also can be used to display any Character as it uses a 5x7 dot matrix to display.

- An LCD allows the user to olp a specific message making the application more user friendly & attractive.

- LCDs are invaluable for displaying status messages & information while a program is being debug.

- The LCDs generally use a common Controller chip, Hitachi 44780 & Common connector.

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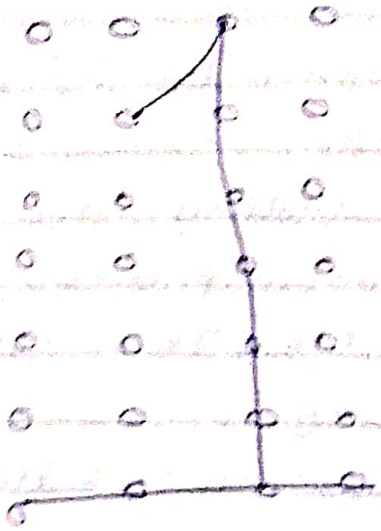
Also that LCD also can be used to display any



Displaying 'a' on LCD display of a 5x7 dot matrix.

- A typical 16x2 (i.e 16 characters & 2 such lines) LCD looks.

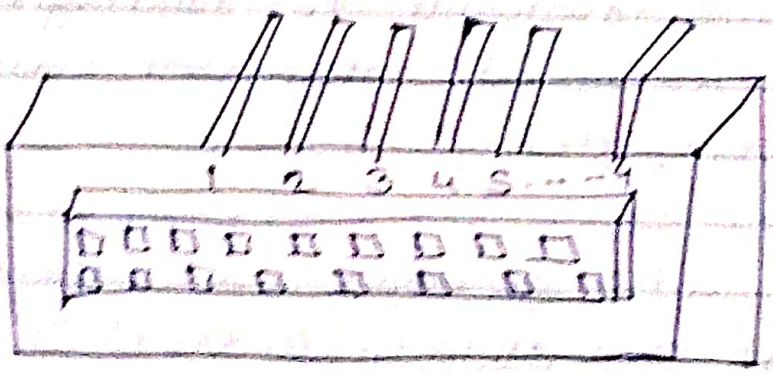


Fig. Structure of 16x2 LCD.

- There are two registers of LCD. viz
  (Instruction Command code register & data register.
- If RS=0 The Instruction Command code register is selected and if RS=1 data register is selected & displayed on LCD.

Que (3) Draw an interfacing diagram of motion detector with PIC18F4550 & write embedded C code for to same.

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- PIR sensor detects inforred heat radiations It can be used to so detect the presence of living objects that emit inforred heat radiation.
- The PIR sensor is split into two sets The two slots are connected to a differential amplifier.
- Whenever, a stationary object is in front of the sensor, The two sets two slots receive the same amount of radiation & o/p is zero.
- This change in o/p volt is result of detection of motio

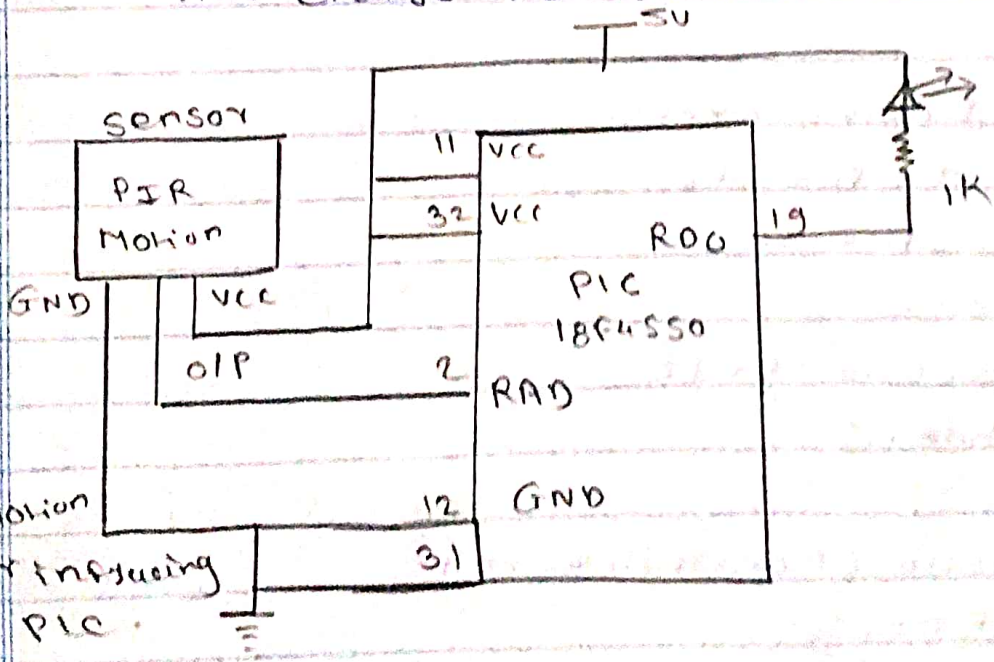

Fig. Motion Sensor interfacing with PIC.

- PIR Sensor: Never keep PIR Sensor close to the wi-fi antenna, ESP32, or Node MCU.
- PIR (Sensor) close to wiFi antenna impacts the sensor's performace.

Code:-

```
# include <Pic 18458so.h>
# include "Configuration_Header_file.h".

# define Motion_detection PORTAbits.RA5
# define PORT_Dir TRISAbits.RA0
# define LED LATDO.
# define LED_Dir TRISIOITS.RDO.
void MSdelay (unsigned int val);
Void Main (void)
{
  A DCON1 = 0X0f;
  PORT_Dir = 1;
 LED_Dir = 0;
 LED = 0;
  OS CCON = 0x72
 (while (1)
 {
 Conile (Motion detution)
  LED = 1;
```

```
    LED=0;
}
}
Void msdelay (unsigned int val)
{
unsigned int i,j
   For (i=0;i<val; i++)
     for (j=0; J<165; J++);
   {

}.
```

Que ④ Differentiate between RS232 & RS485 Serial Communication Protocols.

→

RS232 VS RS485, Both Serial Communication Std made Major impacts on the industry. They are still both fairly widely used even though they are introduced more than half a century ago.

The are two not very different Serial Communications. In the industry their applications varies by not a lot.

- Before we continue, you may check out our other articles to learn more about the RS232 & RS485 respectively.

- Main differences:-

1) Operational Distance.
2) Immunity to electrical noise & ground potential.
3) No. of Transmitters & Receivers.
4) Data transmission Speed.

Voltage System	RS232 Voltage level based	RS485 Differential
Total Drivers + Receivers on one line	1 Driver, 1 Receiver	32 Driver, 32 Receivers
Line Configuration	Point to Point	Multidrop
Maximum Operational Distance	15 M / 50 FT	1,200 M / 3000 Ft
Maximum Data	1 MBits/S	10 MBits/S
Duplex Mode	Full Duplex	Half Duplex or Full
Receiver i/p voltage	+/- 15V	-7V to +12V
Reciever Sensitivity	+/- 3V	+/- 200 mV

Que (5) list the feature of RTC with block diagram.

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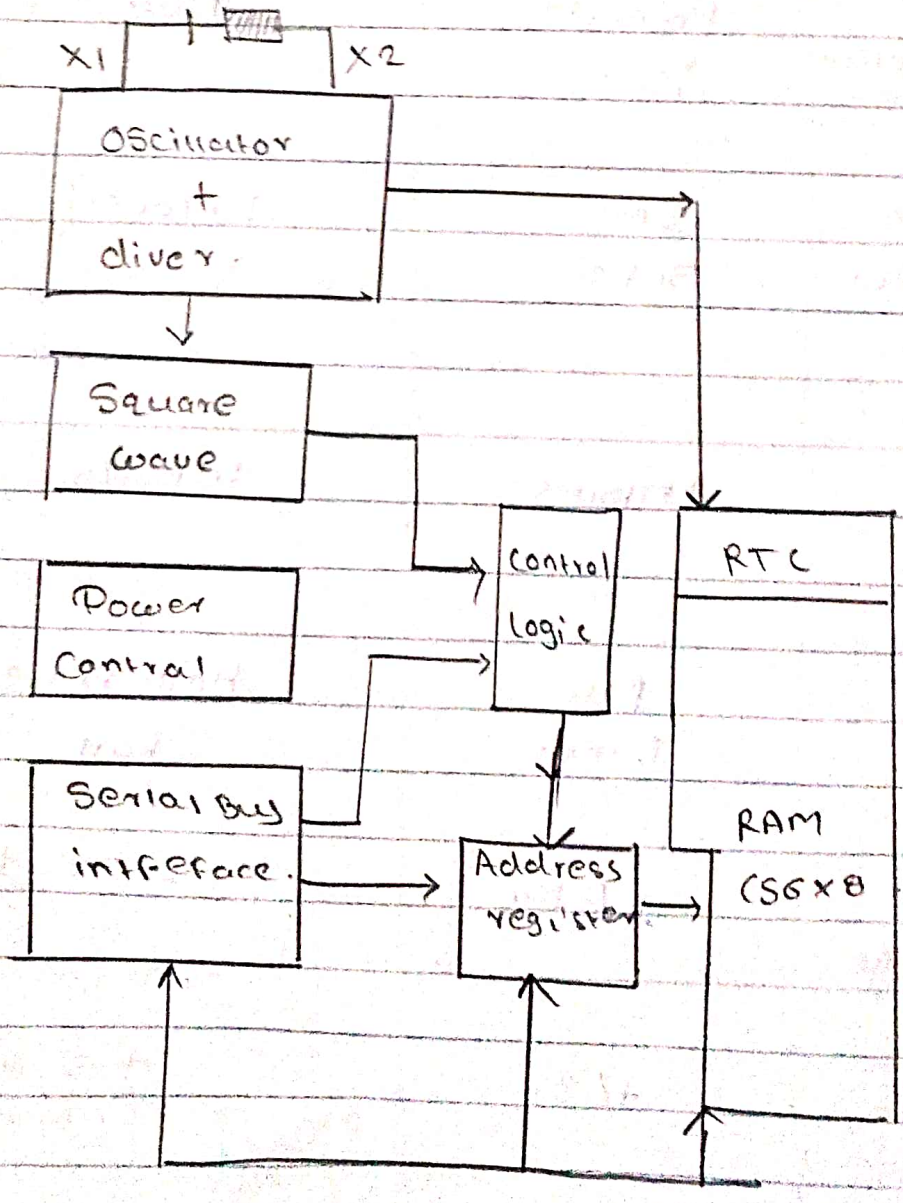
- The block diagram of DS1307 RTC. on the I2C bus the RTC behaves like a slave device.
- By giving a START condition & providing a device identification code followed by a register address, we can access the RTC.



Block Diagram of DS1307 RTC.

Ques ⑤ list the feature of RTC with blocks diagram.

→

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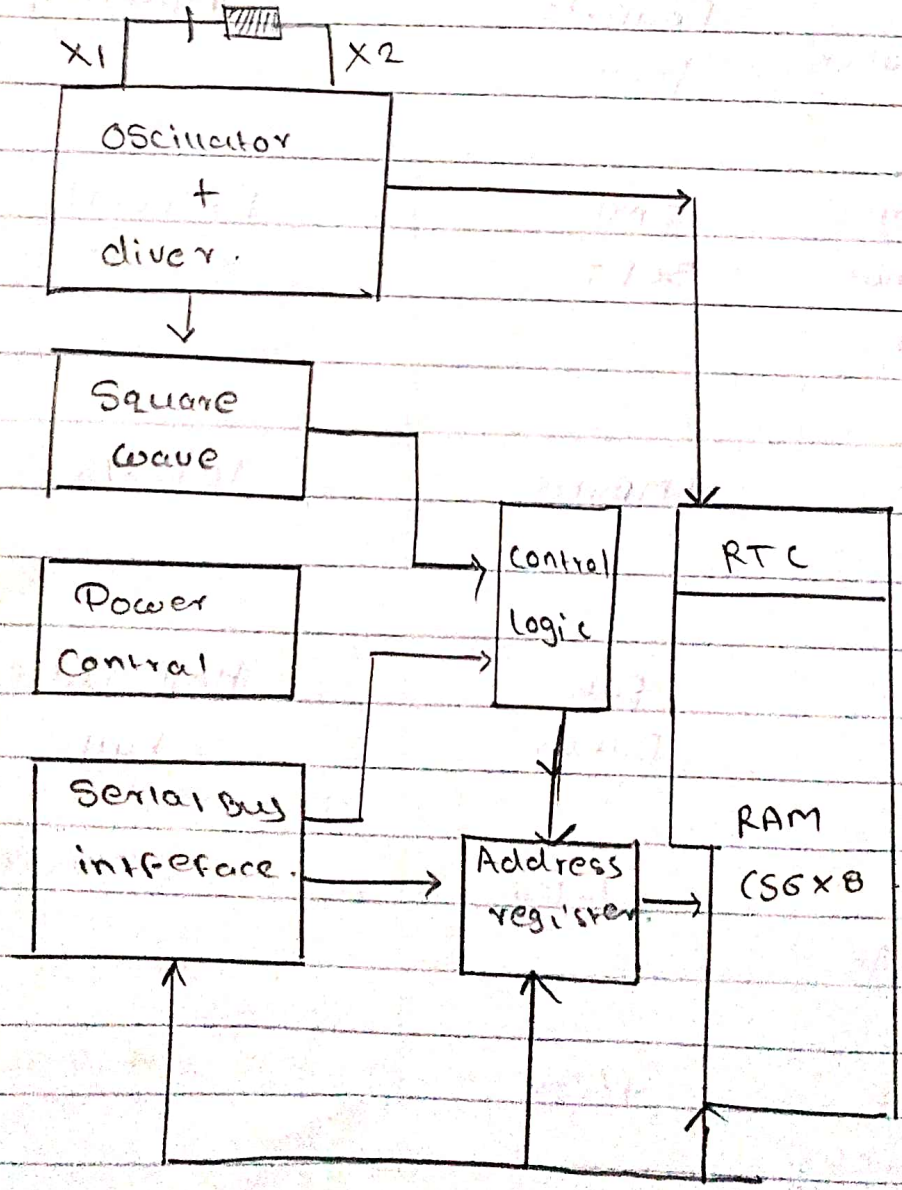
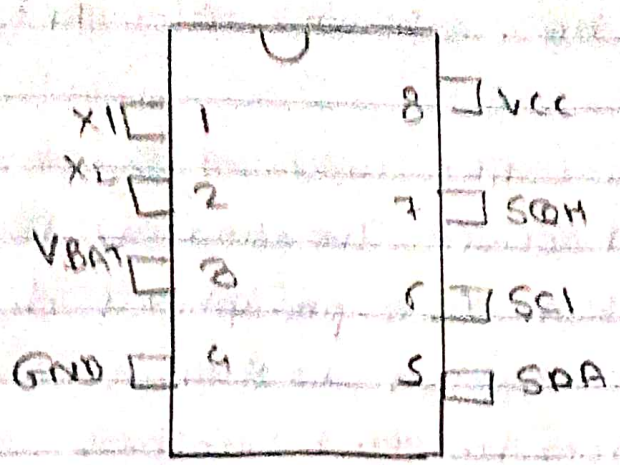


Block Diagram of DS1307 RTC.



Pin diagram of DS1307 RTC.

Features:-

① It keeps a track of seconds, Minutes, Hours, date of the Month, day of week of year with leap-year compensation valid upto 2100

② It supports a I2C two wire Serial interface

③ For storing two data it has a 56-byte, battery backed, Non-Volatile (NV) RAM

④ It has a programmable square-wave output signal.

⑤ It has an in built power sense circuit for detecting the power failures & automatically switch to battery supply.

⑥ It operates in temperature :40°C to +85°C.

Que(7) Draw & explain block schematic of USART.

The 8251 is a USART (Universal Synchronous Asynchronous Receiver Transmitter) for serial data communication. As a peripheral device of a microcomputer system, the 8251 receives parallel data from the CPU & transmits serial data after the conversion. This device also receives parallel data to the CPU after the conversion.

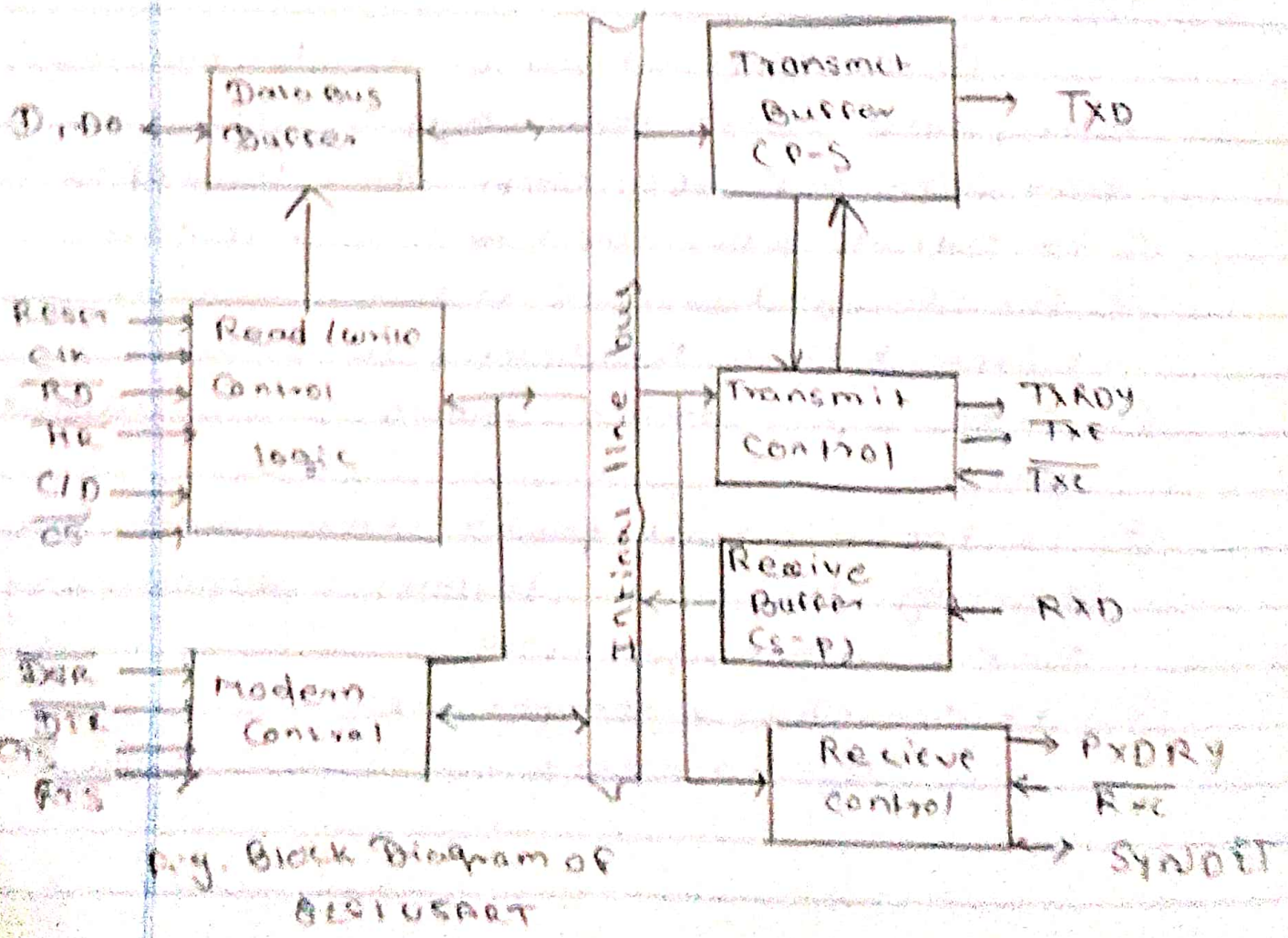


Fig. Block Diagram of 8251USART

- The 8251 functional Configuration is programming by Software. operation between the 8251 & CPU is executed by program control.

$\overline{CS}$	C/D	$\overline{RD}$	$\overline{WR}$	
1	X	X	X	Data Bus 3-State
0	X	1	1	Data Bus 3-State
0	1	0	1	Status → CPU
0	1	1	0	Control Word ← CPU
0	0	0	1	Data → CPU
0	0	1	0	Data → CPU.

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