Government Engineering College Jhalawar
Department of Computer Science Engineering
Even Semester (Session 2017-18)
Subject:- Embedded System Design
Model Test Paper

Attempt all the questions:

1. What is the difference between microcontroller and microprocessor? Give the examples of microcontroller.
2. How many ports are used in 8051 microcontroller? Name the pins reserved for the ports.
3. Why Port P0 has a dual role?
4. The crystal frequency of the 8051 microcontroller is _____.
5. The keyword used in C language for bit programming of the ports_____.
6. Explain the difference between native compiler and cross complier?
7. Why unsigned char is used in 8051embedded C programming?
8. In which case ‘int’ data type is used in 8051 embedded C programming?
9. The header file used in 8051 embedded C programming_____.
10. How the port P0 act as input port.
11. Port _____has the inbuilt pull up registers.

Programming Questions

1. Write an 8051 C program to send the values 00-FF to port P1?
2. Write an 8051 C program to send hex values for ASCII characters of 0,1,2,3,4,5,A,B,C and D to port P1?
3. Write an 8051 C program to toggle all the bits of P1 continuously?
4. Write an 8051 C program to send the values of -4 to +4 to port P1?
5. Write an 8051 C program to toggle the bit D0 of P1 50,000 times. (Hint: Bit programming).
6. Write an 8051 C program to toggle the bit of P1 continuously forever with some delay.
7. Write an 8051 C program to toggle the bit of P1 continuously with 250ms delay.

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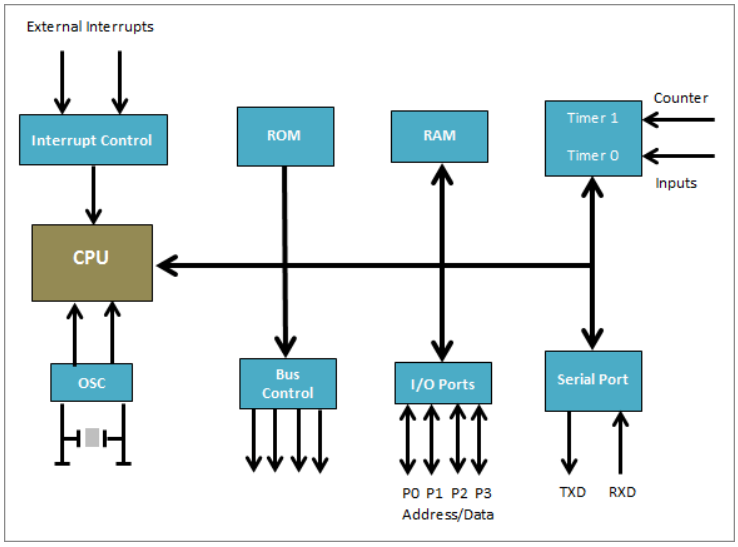
Solution of the model paper

1. Microcontroller

It's like a small computer on a single IC. It contains a processor core, ROM, RAM and I/O pins dedicated to perform various tasks. Microcontrollers are generally used in projects and applications that require direct control of user. As it has all the components needed in its single chip, it does not need any external circuits to do its task so microcontrollers are heavily used in embedded systems and major microcontroller manufacturing companies are making them to be used in embedded market. A microcontroller can be called the heart of embedded system. Some examples of popular microcontrollers are 8051, AVR, PIC series of microcontrollers.



Microprocessor

Microprocessor has only a CPU inside them in one or few Integrated Circuits. Like microcontrollers it does not have RAM, ROM and other peripherals. They are dependent on external circuits of peripherals to work. But microprocessors are not made for specific task but they are required where tasks are complex and tricky like development of software's, games and other applications that require high memory and where input and output are not defined. It may be called heart of a computer system. Some examples of microprocessor are Pentium, I3, and I5 etc.

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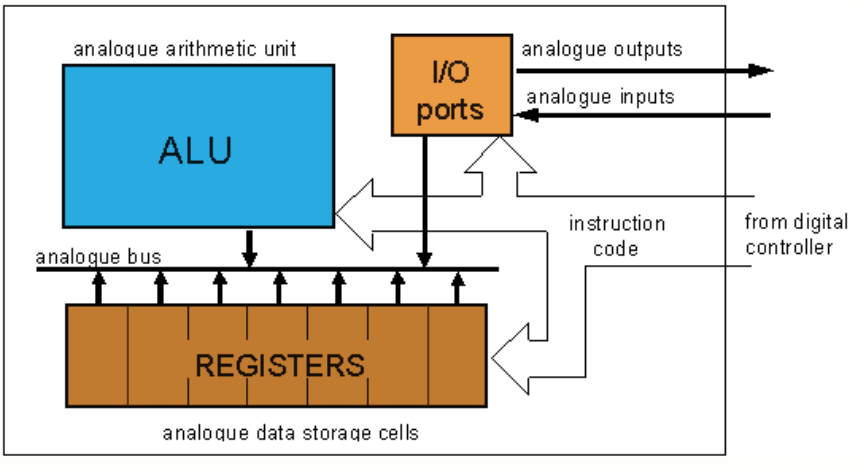

From this image of architecture of microprocessor it can be easily seen that it have registers and ALU as processing unit and it does not have RAM, ROM in it.

Microcontroller Vs Microprocessor

1. Key difference in both of them is presence of external peripheral, where microcontrollers have RAM, ROM, EEPROM embedded in it while we have to use external circuits in case of microprocessors.
2. As all the peripheral of microcontroller are on single chip it is compact while microprocessor is bulky.
3. Microcontrollers are made by using complementary metal oxide semiconductor technology so they are far cheaper than microprocessors. In addition the applications made with microcontrollers are cheaper because they need lesser external components, while the overall cost of systems made with microprocessors are high because of the high number of external components required for such systems.
4. Processing speed of microcontrollers is about 8 MHz to 50 MHz, but in contrary processing speed of general microprocessors is above 1 GHz so it works much faster than microcontrollers.
5. Generally microcontrollers have power saving system, like idle mode or power saving mode so overall it uses less power and also since external components are low overall consumption of power is less. While in microprocessors generally there is no power saving system and also many external components are used with it, so its power consumption is high in comparison with microcontrollers.
6. Microcontrollers are compact so it makes them favorable and efficient system for small products and applications while microprocessors are bulky so they are preferred for larger applications.

7. Tasks performed by microcontrollers are limited and generally less complex. While task performed by microprocessors are software development, Game development, website, documents making etc. which are generally more complex so require more memory and speed so that's why external ROM, RAM are used with it.
8. Microcontrollers are based on Harvard architecture where program memory and data memory are separate while microprocessors are based on von Neumann model where program and data are stored in same memory module.

Solution 2:

There are four ports used in 8051 microcontroller each port is of 8 bits

- Port P0: Pin reserved 32-39
- Port P1: Pin Reserved 1-8
- Port P2: Pin Reserved 21-28
- Port P3: Pin Reserved 10-17

Solution 3:

Because Port P0 has inbuilt pull up registers which are able to carry address as well as data line (AD0 – AD7) . That's why port P0 has a dual role.

Solution 4:

11.0592 MHz.

Solution 5: sbit

Solution 6:

Native compiler compiles the source on the same machine and generates the hex file for the same machine. Whereas cross complier compiles the source on the host machine but generates the hex files for the target device.

Solution 7:

Because 8051 microcontroller has the 8 bit processor and the size of the char data type is also 8 bit.

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Solution 8:

Int data type is used when there is interfacing of 16 bits address lines of port P0 and P2 and it is also used in running the loop especially in implementing the delays.

Solution 9:

#include<reg51.h>

Solution 10:

By pass 1 to all the bits of port P0.

Solution 11:

P0.

Programming Solutions

1. #include<reg51.h>

   main()

   {

   unsigned char z;

   for(z=0; z<255; z++)

   P1=z;

   }

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2. #include<reg51.h>

   main()

   unsigned char mynum [] = “012345ABCD”;

   unsigned char z=;

   for(z=0; z<10; z++)

   P1=mynum[z];

   }

3. #include<reg51.h>

   main()

   {

   for(; ;){

   P1=0x55;

   P1=0xAA;

   }

   }

4. #include<reg51.h>

   main(){

   char mynum [] = {-1,1-2,2-3,3-4,4};

   unsigned char = z;

   for(z=0; z<8; z++)

   P1=mynum[z]; }

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5.
```
#include<reg51.h>

sbit MYBIT = P1^0;

main(){

unsigned int z;

for (z=0; z<50000; z++){

MYBIT = 0;

MYBIT = 1;

}

}
```

6.
```
#include<reg51.h>

main(){

unsigned int x;

for (; ;){

P1 = 0x55;

for (x=0; x<4000; x++);

P1 = x0AA:

for (x=0; x<4000; x++);

}

}
```

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7. #include<reg51.h>

```
msdelay (unsigned int); //Prototyping of user defined function.

main (){

while (1){

P1= 0x55;

msdelay(250); //call by value

P1= 0xAA;

msdelay (250);

}}

msdelay (unsigned int itime) // definition of msdelay

{

unsigned int i, j;

for (i=0; i<itime; i++)

{

        for (j=0; j<1275*; j++);  //1ms delay

}
```

*XTML= 11.0592MHz

90ns X 1275 = 114750ns = 1ms.