*Note: Crystals in STC Micro-controllers are used for to start the micro-controller.*

**Task 1: Setting up development environment, study datasheet and schematics of the development board**

Please answer the following questions about STC89C52 microcontroller

1. What is the size of the RAM and flash.

*ANS:* The STC89C52 is a popular member of the STC89Cxx series of microcontrollers produced by STC Microelectronics. These microcontrollers are based on the 8051 architecture.

The STC89C52 typically has the following memory specifications:

1. RAM (Random Access Memory): The STC89C52 typically has 256 bytes of RAM.

2. Flash Memory: The STC89C52 typically has 8 kilobytes (8 KB) of flash memory for program storage.

These specifications may vary slightly depending on the specific variant of the microcontroller, but these are the common specifications for the STC89C52.

1. How many IO pins are available.

*ANS: The STC89C52 microcontroller typically provides a total of 32 I/O (Input/Output) pins. These pins can be configured as either inputs or outputs based on the requirements of the application. They are organized into four 8-bit ports: P0, P1, P2, and P3. Each port consists of 8 pins, making a total of 32 I/O pins.*

*Here's the breakdown:*

*- Port 0 (P0): 8 pins (P0.0 to P0.7)*

*- Port 1 (P1): 8 pins (P1.0 to P1.7)*

*- Port 2 (P2): 8 pins (P2.0 to P2.7)*

*- Port 3 (P3): 8 pins (P3.0 to P3.7)*

*These pins can be used for various purposes such as interfacing with sensors, controlling external devices, communication with other devices, etc.*

1. What peripherals are available e.g. serial, ADC etc.

*ANS****:*** The STC89C52 microcontroller typically comes with a range of built-in peripherals to support various applications. Some of the common peripherals available in the STC89C52 include:

1. UART (Universal Asynchronous Receiver-Transmitter): The STC89C52 usually features one or more UART modules, allowing serial communication with other devices.

2. ADC (Analog-to-Digital Converter): It typically includes an ADC module for converting analog signals into digital data. The number of channels and resolution of the ADC may vary depending on the specific variant of the microcontroller.

3. Timers/Counters: The STC89C52 usually provides one or more timers/counters, which can be used for generating precise time delays, controlling PWM (Pulse Width Modulation) signals, measuring external events, and more.

4. Interrupt Controller: It typically features an interrupt controller to handle various interrupts generated by internal and external events, allowing the microcontroller to respond to critical events in a timely manner.

5. GPIO (General-Purpose Input/Output): As mentioned earlier, the STC89C52 offers a significant number of GPIO pins that can be configured as inputs or outputs for interfacing with external devices.

6. SPI (Serial Peripheral Interface) and I2C (Inter-Integrated Circuit): Some variants of the STC89C52 may include SPI and/or I2C interfaces for communication with compatible peripherals such as sensors, displays, EEPROMs, etc.

7. Watchdog Timer: It typically includes a watchdog timer to monitor the operation of the microcontroller and reset it in case of a software or hardware malfunction.

1. What is meant by IAP.

*ANS*:

Abbreviation:

IAP - In-Application Programming

Explanation in points:

1. \*\*Flexibility\*\*: IAP allows a microcontroller to be reprogrammed or updated with new firmware or program code while the existing application is running.

2. \*\*No External Programming Tools Needed\*\*: With IAP, there's no need for external programming tools or specialized hardware to update the microcontroller's firmware. This reduces the complexity of the update process and eliminates the need for physical access to the device.

3. \*\*Remote Updates\*\*: IAP enables remote updates of firmware, allowing for convenient updates in the field or over a network connection. This is particularly useful for embedded systems deployed in remote locations or inaccessible environments.

4. \*\*Dynamic Firmware Updates\*\*: IAP facilitates dynamic firmware updates without interrupting the operation of the existing application. This ensures continuous operation of the device while the update process takes place.

5. \*\*Reserved Flash Memory\*\*: Typically, a portion of the microcontroller's flash memory is reserved for storing the new firmware or program code during the update process. This reserved area is erased and overwritten with the new code, ensuring a seamless transition to the updated firmware.

6. \*\*Initiation Mechanisms\*\*: IAP is initiated through specific commands or protocols received via communication interfaces such as UART, SPI, I2C, USB, etc. These commands trigger the update process and provide the necessary instructions for loading the new firmware into memory.

7. \*\*Reset and Execution\*\*: After the update process is complete, the microcontroller may perform a reset to start executing the updated firmware. This ensures that the device transitions smoothly to the new firmware without any disruption to its operation.

8. \*\*Maintenance and Customization\*\*: IAP simplifies maintenance tasks and allows for easy customization of firmware, enabling bug fixes, feature enhancements, and optimizations to be deployed efficiently.

In summary, IAP is a valuable feature in microcontrollers that enables seamless and convenient firmware updates without the need for external programming tools, making it easier to maintain and customize embedded systems in various applications.

1. How many timers are available?

*ANS*:

Based on the provided information, the STC89xx series microcontroller has a total of three timers available:

1. Timer 0: An 8-bit timer/counter.

2. Timer 1: A 16-bit timer/counter.

3. Timer 2: A timer/counter with specific features including being an up/down counter with a programmable clock output on P1.0.

1. How many sources of interrupt are there?

*ANS*:

According to the provided information, the STC89xx series microcontroller supports a total of 8 sources of interrupt. These interrupts can be handled with a 4-level priority structure.

1. Maximum clock frequency supported?

*ANS*:

Operation frequency range: 0- 48MHz@12T, or 0-24MHz@6T

The maximum clock frequency supported by the STC89xx series microcontroller depends on the operating mode selected:

1. For a 12T (12 clocks per machine cycle) configuration, the maximum operating frequency is 48 MHz.

2. For a 6T (6 clocks per machine cycle) configuration, the maximum operating frequency is 24 MHz.