Embedded System

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(1.) What is UART?

Ans ⇒ UART or Universal Asynchronous Receiver. Transmitter is a serial communication device that performs parallel-to-serial data conversion at the transmitter side and serial-to-parallel data conversion at the receiver side. It is universal because the parameters like transfer speed, data speed, etc.

2. What is the difference between von neumann architecture? and Harvard architecture?

Ans ⇒

VON NEUMANN architecture	HARVARD architecture
(i) It is ancient computer architecture based on stored program computer concept.	(i) It is modern computer architecture based on harvard mark 1 relay based model.
(ii) Same physical address is used for instructions and data.	(ii) Seprate physical memory address is used for instruction and data.
(iii) There is common bus for data and instruction transfer.	(iii) Seprate buses are used for transferring data and instruction.
(iv) Two clock cycles are required to execute single instruction.	(iv) An instruction is executed in a single cycle.
(v) It is cheaper in cost.	(v) It is costly than von neumann Architecture.
(vi) CPU can not access instructions and read/write at the same time.	(v) CPU can access instructions and read/write at the same time.
(vii) It is used in personal computers and small computers	(vi) It is used in micro controllers and signal processing.

(3.) What do you mean by hard real time embedded system? mention two applications where we can use this type of embedded system.

Ans ⇒ Hard real time embedded system is a type of system is a type of system that make sure that no deadlines are missed all tasks are completed within the prescribed time frame.

Two applications:

(i) In flight control systems
(ii) Atomic reactor control.
(iii) missile Guidance system.
(iv) weapon degence system etc.

Short answer:

A hard real time system must produce accurate responses to the events within specific time period.

(4.) What is large scale embedded systems?

Ans ⇒ The embedded system have highly complex hardware and software, built around 32-bit or 64-bit processors/controllers, RISC processors, SOC, scalable and configurable processors.

2nd Answer

5. Architecture of microcontroller used in Arduino UNO.

Ans ⇒ Arduino uno is a microcontroller board based on the ATmega 328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as pwm outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button.

6.) Explain about the details of other hardware units available in embedded system.

Ans ⇒ Hardware units in embedded system:

(i) processor: Brain of an embedded system. It is the one which has control unit and execution unit.

(ii) Control unit:

- controls program flow and data path.
- Includes a fetch unit - to fetch program instructions from memory.

(iii) Execution unit:

- Includes Arithmatic and logic unit
- Execute instructions for a program control task like interrupt, halt, reset, call jump.
- Execute application program instructions.

A processor is mostly in the of an IC chip. It could be in the form of ASIC or SOC. processor core is a part of functional circuit on a chip. processor chip or core can be,

- General purpose processor (GPP)
- Application Specific system processor (ASSP)

- Multiprocessor using GPP and application specific instruction processor (ASIP)
- GPP cores or ASIP cores integrated in to an ASIC or VLSI chip.
- FPGA core integrated with processor units in a VLSI chip.

General purpose processor:

A processor having a general purpose instruction set and readily available compilers to enable programing in a high level language is called General purpose processor. It can be microprocessor microcontroller, embedded processor, and digital signal processor.

microprocessor: It has CPU on a chip. It may include additional units like cache memory and floating point processing units for faster processing.

power source:

- System own power supply.
- Supply from a system to which the embedded system interface.
- proper power dissipation management implementation in hardware and software.

~~memory~~:

- ~~Reset for power up~~
- ~~External and internal reset~~
- ~~Reset of timeout, watchdog timer.~~

memory:

- program. code memory - Internal or external ROM, EPROM, Flash.
- Data, stack, heap memory - volatile internal, external or buffer RAM memory.
- Log, configuration, Lookup table - Non volatile EEPROM or Flash.
- cache memory.

microcontroller:

It has CPU, memory and other functional units on a chip. It includes peripherals. like interrupt handler, IO ports, Timer, ADC, etc.

embedded processor:

These are special microprocessors and microcontrollers for fast, precise and intensive calculations. It is for complex real time applications. It is specifically designed for fast context switching, lower latencies and atomic ALU operations.

Interrupt handler:

- Interrupt handler for peripheral IO and timer interrupts.

7. Describe in detail about embedded system on-chip neccessary sketch.

Ans ⇒ A System on chip usually known as an SOC is basically a circuit embedded on a small coinsized chip and integrated with a microcontroller or microprocessor.

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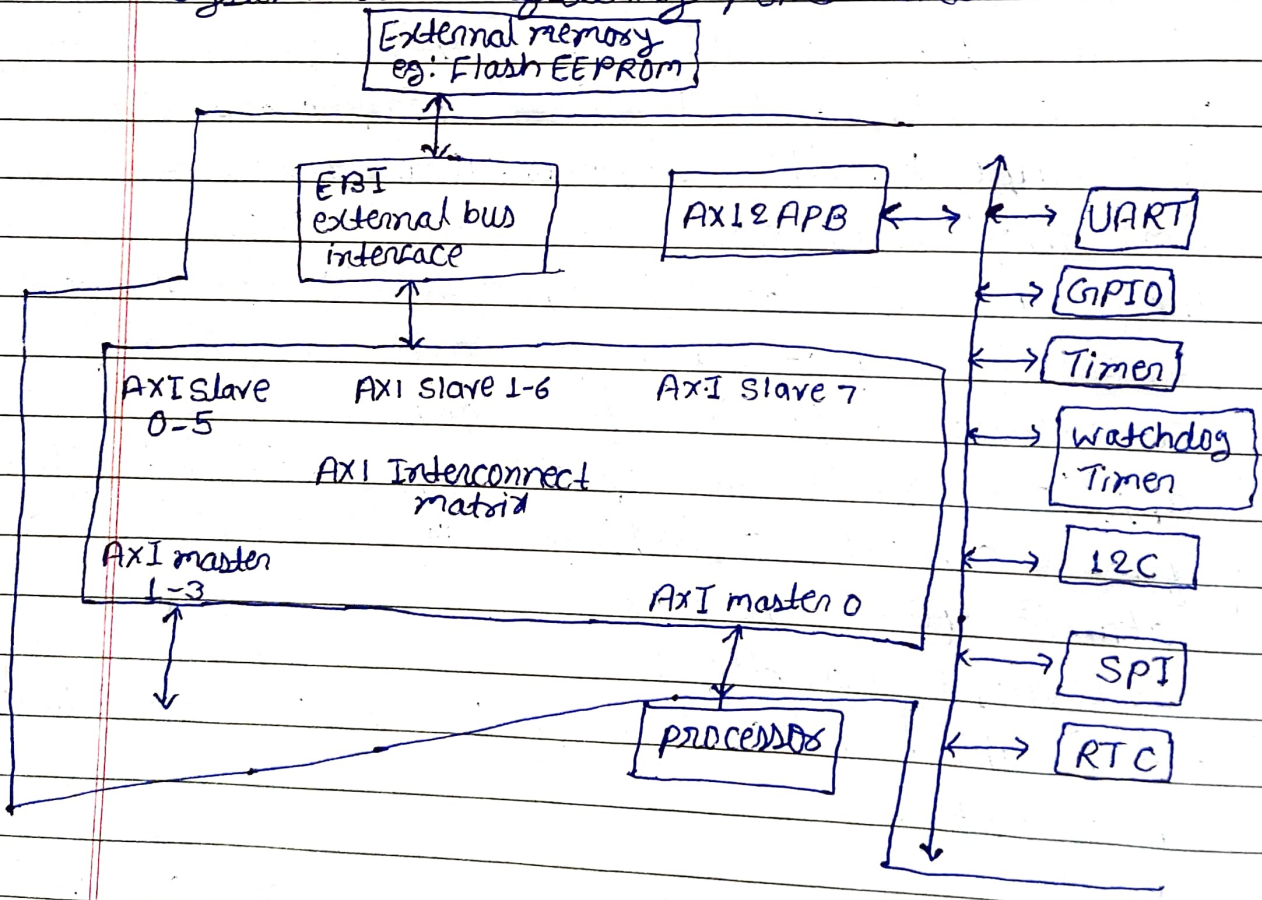
It is called a System on the chip but this chip contains an entire system embedded in it. The design of a system on chip usually includes a central processing unit, memory, ports for inputs and outputs, secondary storage devices, and peripheral interfaced such as I2C, SPI, UART, CAN, Timers etc. Depending upon the requirement it can also consist of a digital or analog signal processing system or a floating-point unit.



8. Discuss about the factors to be considered for selection of processor in embedded system.

Ans ⇒ Selection of processor for an embedded system.

(i) Speed and performance.
(ii) Optimal power usage.
(iii) peripheral support.
(iv) Advanced processing.
(v) cost.

(i) Speed and performance: The most important parameter to judge a processor in embedded system is its performance. while you may be bombarded with loads of values, comparisons and benchmarks that show just how well performing a processor is, you need to determine for yourself whether or not the unit will be able to successfully address the particular needs of your application. you want the processor to be fast and skillful enough to fulfil your requirment A good way to select a CPU is to shortlist a few options and run trial simulations. with your code to formulate your own benchmarks.

(ii) power: Keep in mind that if you are investing in a processor with great performance, it is also going to increase the power consumption. If you search around, you will be able to find solutions that offer high performance with low power consumption.

(iii) peripheral: The supporting peripherals that accompany your CPU are just as important as the unit itself. Since you are paying an additional cost for them, you will want to maximize their potential. Ideally, you will want to go with a processor whose peripherals overlap with the technology your application requires for execution. This results in cost savings, which is a welcome bonus.

(iv) costs: The costs associated with the CPU are very important to take into consideration. not only should the price of the unit itself fall within your budget, but also need to think about the training costs, supporting development tools, and peripherals you will need to maximize the use of the processor. make sure to check all the peripherals beforehand and determine whether or not the system as a whole is worth the price.

Illustrate with example the techniques used for memory devices.

⇒

(10) Write the need for software in embeeded technology.

Ans ⇒ To contol the functioning of a set of hardware devices without compromising on the purpose of the efficiency.

(11) What is flash memory & EEPROM?

Ans ⇒ Flash memory: It is a modern type of EEPROM. It can be erased and rewritten faster than ordinary EEPROM, & newer designs has the feature that is very high endurance.

EEPROM: Electrically erasable and programmabl Read only memory is a memory that the principal of operation is similar to EPROM, but the ways to program & erase are done by exposing it to an electrical charge. It erase one byte at a time.

12. What do you mean by system on chip (SOC)? Give an example.

Ans ⇒ It is a microchip with all the necessary electronic circuits & pods for a given system, such as a smartphone or wearable computer, on a single integrated circuit.
eg: smartphones, tablets, wearable devices etc.

13. What are the diff. memory device used in embeeded system?

Ans ⇒ (i) Volatile memory module - RAM
(ii) Internal data storage circuit for RAM memory chip.
(iii) Non volatile memory - ROM memory.
(iv) Static random access memory (SRAM)
(v) Dynamic access random memory (DRAM)
(vi) programmable Read only memory.

(15.) Distinguish between microprocessor & microcontroller.

Ans ⇒

microprocessor	microcontroller
(i) microprocessor are multitasking.	(i) microcontroller is single task oriented.
(ii) RAM, ROM, I/O ports & ~~irrotable~~ timers can be added externally & can vary in numbers.	(ii) RAM, ROM, I/O ports and timers cannot be added together on a chip.
(iii) External support of external memory makes a ~~microcontro~~ microprocessor based system heavier and costlier	(iii) A microcontrollers are light weight & cheaper than a microprocessor.
(iv) require more space and power consumption is higher.	(iv) It consumes less power & takes less space.
(v) It has RAM memory & an operating system that loads a variety of applications into RAM & lets the CPU run them (vi) eg: computer system.	(v) There is only one application software that is typically burned into ROM. eg: washing machine.

16. What is system on chip? Explain embedded systems change with system on chip?

Ans ⇒ A system on chip usually known as an SOC is basically a circuit embedded on a small coinsized chip and integrated with a microcontroller or microprocessor. (same like 12 no.)

17. What is processor architecture? What are the different processor architectures available for processor design?

Ans ⇒ processor architecture is a processor made of transistors. The transistors are arranged in a sort of hardware based computer program see that ps designed to accept inputs & process them into outputs.

Two types:

(i) ~~Hardware~~ Harvard architecture

(ii) Von neuman architecture

19. What are the programming language used in embedded systems?

Ans ⇒ Developers use a variety of programming language in embedded systems. The most used language include C, C++, Python, micropython and Java.

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20. Explain about significance of embedded systems and classification of the embedded systems.

Ans⇒ Significance:

(i) It is easy for mass production.
(ii) It has improved product quality.
(iii) It has low maintainence and high availability.
(iv) consumes low power.
(v) It works in real time.

Classification of embedded system:-