



SNS College of Technology, Coimbatore – 35
Department of Electronics and Instrumentation Engineering

CS2364 – Embedded System

2Marks Questions and Answers

III Year, 6th Sem, EIE

UNIT I - INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to embedded real time systems – The build process for embedded systems – Embedded system design process-Embedded computory applications-Types of memory – Memory management methods.

UNIT II - EMBEDDED SYSTEM ORGANIZATION 9

Structural units in processor, selection of processor & memory devices – DMA – I/O devices : timer & counting devices – Serial communication using I2C, CAN USB buses – Parallel communication using ISA, PCI, PCI/X buses – Device drivers

UNIT III - PROGRAMMING AND SCHEDULING 9

Intel I/O instructions – Synchronization - Transfer rate, latency; interrupt driven input and output - Nonmaskable interrupts, software interrupts, Preventing interrupts overrun - Disability interrupts. Multithreaded programming –Context Switching, Preemptive and non-preemptive multitasking, semaphores. Scheduling-thread states, pending threads, context switching

UNIT IV - REAL-TIME OPERATING SYSTEMS 9

Introduction to basic concepts of RTOS, Unix as a Real Time Operating system – Unix based Real Time operating system - Windows as a Real time operating system – POSIX – RTOS-Interrupt handling - A Survey of contemporary Real time Operating systems:PSOS, VRTX, VxWorks, QNX, µC/OS-II, RT Linux – Benchmarking Real time systems - Basics,

UNIT V - PIC MICROCONTROLLER BASED EMBEDDED SYSTEM DESIGN 9

PIC microcontroller – MBasic compiler and Development boards – The Basic Output and digital input – Applications

TOTAL : 45 PERIODS

Unit I - Introduction to Embedded System

1.1. What is an embedded system? (apr 2010)

An Embedded system is one that has computer-hardware with software embedded in it as one of its most important component. It is a dedicated computer-based system for an application or product. It may be either an independent system or a part of a larger system. Ex: VCRs, digital watches, elevators, automobile engines, thermostats & instruments that are driven by microprocessors and their software.

1.2. Define microcontroller.

A microcontroller is a single-chip VLSI unit which, though having limited computational capabilities possesses enhanced input-output capabilities and a number of on-chip functional units. Microcontrollers are particularly suited for use in embedded systems for real-time control applications with on-chip program memory and devices.

1.3. List out the microprocessors used in embedded systems.

The various microprocessors used in embedded systems are:

- Intel 8051 family
- Zilog Z80 family,
- Intel 80x86 family,
- Motorola 68000 family
- SPARC
- IBM PowerPC 601, 604

1.4. List out the factors to be considered while writing embedded application programs. (Apr2010)

The various factors that must be considered while writing embedded application program are:

- Throughput
- Response
- Testability
- Debug ability
- Reliability
- Memory space
- Program installation
- Power consumption
- Cost

1.5. Define bus fight.

The situation in which more than one processor tries to access common bus at the same time in multiprocessor system is called bus fight.

1.6. Define Bus handshaking.

The process of exchanging control information between the processor and other hardware units before exchanging actual data is called bus handshaking.

1.7. What is the use of DMA?

DMA is a circuitry that can read data from an I/O device, such as a serial port or a network, and then write it into memory or read from memory and write to an I/O device, all without the software assistance and the associated overhead.

1.8. Define Interrupt.

Interrupts are those that interrupt the microprocessor to stop what it is doing and execute some other piece of software, the interrupt routine, after completion of which the normal flow can be restored.

1.9. What is Interrupt vector table?

To find out the location of interrupt routine, a table somewhere in memory contains interrupt vectors, the addresses of the interrupt routines. When an interrupt occurs, the microprocessor will look up the address of the interrupt routine in the interrupt vector table. This table must be set properly by the users.

1.10. What is the use of Watchdog timer?

A watchdog timer resets the microprocessor and starts the software over from the beginning if the software does not restart it periodically. It is used to rescue the system if a fault develops and the program gets stuck.

1.11. What is UART?

A UART is Universal Asynchronous Receiver and Transmitter. It is used for serial data communication on serial ports such as RS-232 ports. It is controlled by the microprocessor through a collection of registers.

1.12. What is ASSP?

ASSP is Application Specific System Processor. It is a processing unit for specific tasks, for example, image compression, and that is integrated through the buses with the main processor in the embedded system.

1.13. Define ASIP.

ASIP is Application Specific Instruction Processor. A processor designed for specific application on a VLSI chip.

1.14. What is virtual device?

A program that acts as physical I/O device is called virtual device. Example: A file or pipe that is programmed for opening and closing and for reading and writing, such as a program for attaching and detaching a physical device and for input and output.

1.15. Define kernel.

A program with functions for memory allocation and de-allocation, task scheduling, inter-process communication, effective management of shared memory access by using the signals, exception handling signals, semaphores, queues, mailboxes, pipes and device management.

1.16. What is SoC?

A System on Chip that has all of needed analog as well as digital circuits. Example: Mobile phone, Smart card.

1.17. What do you mean by charge pump?

Certain systems do not have a power source of their own: They connect to an external power supply or powered by the use of charge pumps. Example: Network Interface Card (NIC), Graphic Accelerator & Mouse.

A charge pump consists of a diode in the series followed by a charging capacitor. The diode gets forward bias input from an external signal; for example, from an RTS (Request to Send) signal in the case of the mouse used with a computer.

Charge pumps bring the power from a non-supply line. It is an active low signal. The charge pump inside the mouse uses it to store the charge when the mouse is in an idle state. The pump dissipates the power when the mouse is used.

A regulator circuit getting input from the charging capacitor gives the required voltage supply. A charge pump in a contact-less smart card uses radiations from a host machine when inserted into that.

1.18. What is GPIB?

General Purpose Interface Bus (GPIB) link is a standard bus originally developed by HP (Hewlett Packard) that links the measuring and instrumentation systems. The embedded system used in the instrumentation systems uses this interfacing standard.

1.19. Define glue logic circuit.

The glue logic circuit of an embedded system is a circuit for interconnecting the processor to external memories so that the appropriate chip-select signals, according to the system memory, map each of the memory chips. The glue logic circuit also includes a circuit to interconnect the parallel ports to the peripherals. This circuit is designed by programming and configuring PAL, GAL, CPLD, and PLD.

1.20. What is ROM image?

The final stage of embedded software is called ROM image. Image is a unique sequence and arrangement of pixels, embedded software is also a unique placement and arrangement of bytes for instructions and data.

1.21. Give examples for sophisticated embedded systems.

- Embedded system for wireless LAN and for convergent technology devices
- Embedded system for real time video and speech or multimedia processing systems
- Security products and high speed network security.
- Embedded sophisticated system for space lifeboat(NASA's X-38)

1.22. What is media processor?

Media processor is a new innovative processor with high system performance for real-time video-performance, audio processing and data streaming. A media processor combines the capabilities of the processor, video processor and IO processor. Example: Nexperia PNX1300.

1.23. What is embedded processor? Give example.

A microcontroller or microprocessor which is specially designed with the following capabilities is called embedded processor.

- Fast context switching
- Atomic ALU operation
- RISC core is for fast, more precise and intensive calculations by the embedded software.
- Example: ARM 7, AMD family 29050

1.24. Explain Stand alone and real time embedded system?

Standalone system doesn't require any additional hardware to implement the targeted application, but in real time system the task in hand must be completed within a bounded time.

Unit II - Embedded System Organization

2.1. Explain three modes of serial communication with one example each?

Synchronous: Communication in which a constant phase difference is maintained between the clocks that guide the transmitter and receiver. A maximum time interval is pre-fixed between which a frame of bytes transmits.

Iso-synchronous: Communication in which a constant phase difference is not maintained between the frames but maintained within a frame. Clocks that guide the transmitter and receiver are not separate. Only the maximum time interval is not pre-fixed between which a frame of bytes transmits

2.2. What do you mean by software timer?

A software Timer is software that executes and increases or decreases a count variable on an interrupt on a timer output or on a real time clock input.

2.3. What is PMA?

Physical Media Attachment subunit which is integrated in IO devices to connect input and output of voice, music, video and images from the physical media in real time application

2.4. What is SerDes?

Serialization and De-serialization subunit in an IO device

It is used to perform serial to parallel and parallel to serial conversion during serial data communication automatically.

2.5. What is free running counter? (Apr 2010)

A counter, which starts on power-up, which is driven by an internal clock (system clock) and which can neither be stopped nor be reset.

2.6. How error is detected in CAN bus?

Receiver node uses the CRC code of the Control Area Network bus frame format to detect error.

2.7. What services does an I²C Bus do?

I²C is a serial bus for interconnecting ICs. It is used in microcontroller based systems. It uses two lines.

SDL: Serial Data Line for transferring data

SCL: Serial Clock Line: indicates valid data on data line.

2.8. What is data-push programming style?

Master writes a slave by sending slaves address & the data byte.

Slaves cannot initiate transfer, master sends read request & slave respond for that.

2.9. What is CSMA/AMP?

CSMA/AMP: Carrier Sense Multiple Access with Arbitration on Message Priority

A node stops transmitting on sensing a dominant bit (0), which indicates that another node is transmitting.

2.10. Define Cyclic & Acyclic mode of operation in counter.

Cyclic Mode: Once the counter reaches the done state, it is automatically reloaded and counting process continues.

Acyclic Mode: The counter/Timer waits for an explicit signal from the microprocessor to resume counting.

2.11. Differentiate hardware and software interrupt.

When a device port is ready, a device or port generates an interrupt or when it completes the assigned action it generates an interrupt. These interrupts are called hardware interrupts. When software runtime exception condition is detected, either processor hardware or a software instruction SWI generates an interrupt for exception. An SWI instruction INT n in 80X86.

2.12. Explain the sequence of steps to be followed when an interrupt event occurred.

CPU on interrupt event may initiate a further action by vectoring to a vector address and calling an ISR or else it continues with current process if the interrupt is masked or disabled.

2.13. Explain the chip select logic to identify the external device.

An embedded system connects to the devices like keypad, touch screen, multiline display unit, printer or modem or motor through ports. During a read or write operation, the processor accesses that address in a memory mapped I/O, as if it accesses a memory address. A decoder takes the system memory IO address bus signals as the input and generates a port or device select signal, CS and selects the port or device.

2.14. Define a device decoder.

A circuit to take the system address bus signals as the as the input and generate a device select signals, CS for the port address selection during the device read or write instruction of the system processor.

2.15. Define control and status register.

Control register is a special function register used for controlling the device operation or programs the actions of a device. Status register is a special function register used for saving the status of the result of arithmetic and logical operation.

2.16. Define counter.

Counter is an internal important unit in microcontroller for getting the count inputs on the occurrence of events that may be at irregular intervals. It functions as timer when given count input at regular intervals.

2.17. What is a key de-bouncing?

When a key pressed, due to spring action, the key vibrates and thus makes and breaks the contacts. This causes multiple 0s and 1s before the switch pressed state is accounted for. De-bouncing by hardware or software removes the signals due to bounce.

2.18. Define event.

Event is a change of present condition, which gives an electric signal at input or output pin or which changes a status bit or which interrupts the processor to enable some action by switching the context and running an ISR.

2.19. Define Full duplex and Half duplex communication.

Full duplex: A serial port having two distinct I/O lines or communication channels. For example, a modem connection to the computer COM port. There are two lines TxD and RxD at 9pins or 25 pins connector. Message flows both ways at an instance.

Half duplex: A serial port having one common line or I/O communication channel. For example a walky-talky where message flows one way at an instance.

2.20. Explain handshake signals.

The signals exchanged before the actual data transfer or storing the bits at the port buffer or the signals to setup or end the communication between source and destination.

2.21. Explain the function of keyboard controller.

The controller for interfacing with keypads and keyboard such that they do debouncing of keys, buffer the input characters and interrupt the processor on each input or at end of the line character and send ASCII codes as input to the processor for further processing and interpretation as data or command.

2.22. Define Input and Output buffer.

A buffer where an input device puts a byte and the processor read that later is called input buffer

A register buffer from where an output device receives the byte after a processor does write operation is called output buffer.

2.23. Define protocol.

A way of transmitting messages on a network by using software that adds additional bits such as the starting bits, header, address of source and destination, error control and ending bits. A protocol suite may have multiple layers and each layer or sublayer uses its protocol before a message transmits on a network.

2.24. What do you mean by an open drain output?

Open drain output: A gate with an internally missing connection between its drain and supply.

The advantage is that it pulls up the required circuit voltage and current levels when interfacing. An external pull up circuit is needed when using an output.

2.25. Define PISO and SIPO.

PISO: A shift register for a parallel input and serial output. It is used for serial bit reception in synchronous mode.

SIPO: A shift registers for serial input and parallel output. It is used for serial bit transmission in synchronous mode.

2.26. Define microarchitecture.

When processor architecture refers specifically to the architectural instruction sets and programmers model, the term microarchitecture refers specifically to the

implementation of those architectures. A processor may have CISC architecture with an RISC microarchitecture implementation.

<http://studyzone.dgpride.com>

Unit III - Programming And Scheduling

3.1. What do you mean by in-line assembly?

A fragment of codes in assembly language that is inserted in between the high-level language codes is called in-line assembly.

3.2. Explain the polygon queuing method with an example.

Polygon queuing means, when a memory-block holding a queue fills and the tail pointer reaches the end of the block-end another empty block starts inserting the elements. Ex: Data from the data link layer at an Ethernet LAN .

3.3. What do you mean by source code engineering tool?

It is a powerful tool to engineer source codes and also to help in debugging and performance analysis of the codes in high-level languages.

3.4. What are the benefits of using assembly language?

Programming in assembly language gives the important benefit of precise control of the processors internal devices and full use of processor specific features in its instruction set and addressing modes. Also the machine codes are compact and device driver codes may require only a few assembly instructions.

3.5. What do you mean by memory optimization?

When codes are made compact and fitted in small memory areas without affecting the code performance is called memory optimization.

3.6. List the five flags used in Queues.

The five flags used are Qerrorflag, headerFlag, trailingFlag, CirQuFlag and PolyQuFlag.

3.7. What is a macro?

A macro is a collection of codes that is defined in a program by a name. It differs from a function in the sense that once a macro is defined by a name, the compiler puts the corresponding codes for it in every place where that macro name appears.

3.8. What are the advantages of building ISR queues?

It reduces significantly the ISR latency periods. Each device ISR is therefore able to execute within its stipulated deadline.

3.9. What are the advantages of using freeware GNU C/C++ compiler?

A GNU C/C++ compiler is configurable both as host compiler as well as cross compiler. It supports 80x86, Window 95/NT, 80x86 RedHat Linux and several other platforms. It supports 80x86, 68HC11, 80960, PowerPC and several other target system processors.

3.10. What are the features of C language that makes it a high level language?

It is a language between the low (assembly) and the high level language. It has the feature of embedding assembly codes using in-line assembly and the ready availability of modules in C compilers for the embedded system and the library codes that can directly port into the system programmer codes.

3.11. What is type checking?

It is essential to make a program less prone to errors.

For ex. , it does not allow arithmetic operations to be performed on *char* data types, also enables the usage of '+' for concatenation.

3.12. Define Process.

A process is a code that has its independent program counter values and an independent stack. It is a computational unit that processes on a CPU under the control of a scheduling kernel of an operating system.

3.13. Define Task.

It is a computational unit or a set of codes, actions or functions that processes on a CPU under the control of a scheduling kernel of an operating system. Every task has a TCB.

3.14. What do you mean by Re-entrant functions?

It is usable by several tasks and routines synchronously (at the same time). This is because all the argument values are retrievable from the stack.

3.15. What is a Semaphore?

It is special variable used to take note of certain actions to prevent another task or event from proceeding.

3.16. What is the advantage of having multiple semaphores?

Multiple semaphores are used so that different set of semaphores are shared among different set of tasks.

3.17. What is the disadvantage of cooperative scheduling?

The disadvantage of cooperative scheduling is that a long execution of a low priority task makes a high priority task wait atleast until it finishes. There is further disadvantage if the cooperative scheduler is cyclic but without a pre-defined time slice.

3.18. Define RTOS.

RTOS: Operating system with real time task scheduling, interrupt latency control, synchronization of tasks with IPC's predictable timing and synchronization behavior of the system.

3.19. What is RPC?

Remote procedure call is method used for connecting two remotely placed methods by first using a protocol for connecting the processes. It is used in the case of distributed tasks.

3.20. What are the parameters of TCB?

It is memory block that holds information about the program counter, memory map, the signal(message)dispatch table, signal mask, task ID, CPU state(registers etc.), stack(for executing system calls etc..).

3.21. What is a mailbox?

A message mailbox is an IPC queue that can be used only by a single destined task.

3.22. Differentiate a task from a thread.

Task is kernel- controlled whereas threads are process-controlled. Task is a heavy-weight process whereas a thread is a light weight process and a task can call another task but a thread cannot.

3.23. What is Dynamic program scheduling?

The processor first analyzes the various tasks to be scheduled & then sets the timer based on it.

3.24. Define multithreading.

The process by which one thread forks out many threads and a job is assigned to each thread.

3.25. Suggest methods to solve the Shared data problem.

- Use volatile modifier
- Use reentrant functions
- Disable interrupts before entering critical section
- Put shared value in circular queues.

3.26. What are counting semaphores?

Unsigned integers that controls the blocking or running of codes of a task as well as of an accompanying task with which it shares value are called semaphores.

3.27. What is priority inversion?

A problem in which a low priority task inadvertently does not release the process for the high priority task is called priority inversion.

3.28. When and where do we use spin locks?

A spin lock successively tries to decrease the trial periods before finally blocking a task and does not block a running task instantly.

UNIT IV - REAL-TIME OPERATING SYSTEMS

4.1. Define Process.

A process is a code that has its independent program counter values and an independent stack. It is a computational unit that processes on a CPU under the control of a scheduling kernel of an operating system.

4.2. Define Task.

It is a computational unit or a set of codes, actions or functions that processes on a CPU under the control of a scheduling kernel of an operating system. Every task has a TCB.

4.3. What do you mean by Re-entrant functions?

It is usable by several tasks and routines synchronously (at the same time). This is because all the argument values are retrievable from the stack.

4.4. What are the rules of Re-entrant functions?

All the arguments pass the values & none of the arguments is a pointer whenever a calling function calls that function.

When an operation is not atomic, that function should not operate on any variable, which is declared outside the function or which an interrupt service routine uses or which is a global variable but passed by reference and not passed by value as an argument into the function.

That function does not call any other function that is re-entrant.

4.5. What is a Semaphore?

It is special variable used to take note of certain actions to prevent another task or event from proceeding.

4.6. What is the advantage of having multiple semaphores?

Multiple semaphores are used so that different set of semaphores are shared among different set of tasks.

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A message mailbox is an IPC queue that can be used only by a single destined task.

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- Use volatile modifier
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A problem in which a low priority task inadvertently does not releae the process for the high priority task.

4.18. When and where do we use spin locks?

A spin lock successively tries to decrease the trial periods before finally blocking a task and does not block a running task instantly.

Mention the different task states. They are

- Idle
- Ready
- Running
- Blocked (waiting)

4.19. How are interrupt routines handled in RTOS environment?

- Direct call to ISR by an interrupting source.
- Direct call to RTOS by an interrupting source and temporary suspension of a scheduled task.
- Direct call to RTOS by an interrupting source and scheduling of tasks as well as ISR's by RTOS.

4.20. List the three methods by which fixed scheduling can be defined?

- Simulated annealing method
- Heuristic method
- Dynamic programming model.

4.21. What is Socket?

A socket provides the logical link using a protocol between the tasks in a client-server or peer-to-peer environment.

4.22. What is meant by context switching?

The process of pushing all of the registers at the beginning of an interrupt routine is known as saving the context and the process of popping them at the end are known as restoring the context.

4.23. Define shared data problem.

This is illustrated by an example. A code monitors two temperatures which are supposed to be equal. They indicate a malfunction if the temperatures differ. The interrupt happens periodically & the interrupt routine reads the temperatures. Once the temperatures are read and they are assigned to temporary variables for comparison. If interrupt occurs in between these lines, then the code would indicate error in spite of the fact that the temperatures are same. This problem is called shared data problem.

4.24. Define critical region.

A part of the program is said to be “atomic” if it cannot be interrupted. A set of instructions that must be atomic for the system to work properly is often called a critical section.

4.25. Define interrupt latency.

Interrupt latency refers to the amount of time it takes a system to respond to an interrupt. To keep interrupt latency low we should make interrupt routines short, Disable interrupts for only short periods of time

4.26. List out the factors that influence interrupt latency.

The various factors that influence interrupt latency are:

The longest period of time during which the interrupt is disabled

The period of time it takes to execute any interrupt routines for interrupts that are of high priority than the one in question.

4.27. How long it would take the microprocessor to stop what it is doing, do the necessary bookkeeping, & start executing instructions within the interrupt routine

How long it takes the interrupt routine to save the context and then do enough work that what it has accomplished counts as a “response”

Unit V - PIC Microcontroller Based Embedded System Design

5.1. Write the advantages of PIC microcontroller?

- High performance RISC CPU with 35 no. of instruction set only
- Harvard Architecture
- Pipelined Instructions
- Single Cycle, Single Word, Orthogonal instructions
- And a large number of Peripherals In-built

5.2. Write the disadvantages of PIC microcontroller?

- Low operating speed.
- High power consumption
- Limited memory resource

5.3. List some applications used by PIC microcontroller?

HVAC, VCRs, digital watches, elevators, automobile engines, thermostats & instruments that are driven by microcontrollers and their software.

5.4. Explain Threshold voltage?

The input voltage that separates a low from a high, the threshold V_T , minus a small increment is read as a low while the threshold voltage plus a small increment is read as high.

5.5. What is undefined region?

Undefined region is the voltage level between V_{IL} and V_{IH} . Input voltage in the undefined region may be read as a low or as high, as the PICs input circuitry may produce one result or the other.

5.6. What is Schmitt Trigger input

A Schmitt trigger has different transition voltages, depending on whether the input signal is changing from high to low or low to high.

5.7. What is switch bounce?

When a mechanical switch operates the contact bounce phenomena will happen. In most switches the contact separation operation relatively clean, but the contact closure exhibits multiple events. Keyboard is an electromechanical device that takes some time to reach steady state. This time is called key debounce time.

5.8. What is the need for compiler?

Compiler is used for converting program written in high level language in to machine understandable language ie binary language.

5.9. What is the use of Debugger?

Debugger is a tool used for troubleshooting and fixing the errors in the program written for an embedded system.

5.10. Explain the series of PIC microcontroller?

We have 12C508A, a 12 bit device and the 12F629, a 14 bit device and 16 bit device.

5.11. List the temperature ranges of PIC microcontroller.

- C-Commercial 0⁰C to 85⁰C
- I- Industrial -40⁰C to 85⁰C
- E-Extended -40⁰C to 125⁰C

5.12. What is the family number available in PIC microcontroller?

Pic12, Pic14, Pic16, Pic18 are the family members.

5.13. Explain 'E' in PIC microcontroller?

It is the temperature range designator, E-Extended -40⁰C to 125⁰C

5.14. Why we need Flash memory?

Flash memory is for porting the program very fastely in the targeted hardware.

5.15. Explain “-xx” in PIC microcontroller?

Maximum clock frequency to decide the operating speed of the controller, generally it is represented in terms of MIPS.

5.16. Explain Harvard Architecture?

PICs use the Harvard Architecture, Used mostly in RISC CPUs (we'll get there)
Separate program bus and data bus: can be different widths!

For example, PICs use:

Data memory (RAM): a small number of 8bit registers

Program memory (ROM): 12bit, 14bit or 16bit wide (in EPROM, FLASH, or ROM)

5.17. What is Leakage current?

When the 2N4401 is cut off- that is , the base voltage is less than about 0.4 V, some leakage current, I_{CEX} will still flow through the device's collector. I_{CEX} is rated to exceed 0.1 A in the 2N4401, a negligible value in the context of our circuits.

5.18. Explain Low side switching?

Low side switching is switching between the load and ground. When closed, both sides of the switch are at ground potential

5.19. What is Isolated switching?

There is no common connection between the circuit being switched and the controlling PIC.

5.20. Name some Development boards?

Basic micro 0818 development board

5.21. What is CE stands in PIC microcontroller?

CE-stands for one time programmable IC, which is available in very low cost version EPROM memory available inside the chip.

5.22. What is MBasic compiler Software?

MBasic compiler is a professional version software in which we are having assembler, debugger, compiler and all the development tools integrated in an IDE.

5.23. Explain Development board?

Development board is a hardware in which we are having all the possible input device and output device and serial and parallel ports for porting the downloadable image file in to the target hardware.

5.24. What is Port? How many ports are there in PIC Microcontroller?

Port is medium through which controller communicates with the outside world. Pic microcontroller has 5 I/O ports.

5.25. Difference between compiler and interpreter?

Compiler is a program which converts the whole program in to machine understandable program but **interpreter** converts line by line

5.26. What is protection bit?

A bit at the ROM, which the processor uses for not letting the instructions and data in the protected part on the system buses. The processor externally blocks the write cycles for these protected addresses.

5.27. What do you mean by personalization key?

It is a key placed after testing the smart card circuit. The card is personalized for its own protected area of memory and own translation scheme for conversion between physical and logical addresses during actual running of the tasks at the card. After insertion of this key, the RTOS and application use only the logical addresses, and the processor uses this key during the translation between two addresses.

5.28. What is fabrication key?

It is a key embedded in ROM at the time of card fabrication so that the card gets a unique identity.

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