

2- MARKS EMBEDDED SYSTEMS

UNIT-1

1. Define Embedded Systems.

An embedded system is a system that has software embedded into computer-hardware, which makes a system dedicated for an application(s) or specific part of an application or product or part of a larger system

2. What are the classifications of Embedded system?

Small scale Embedded System

Medium scale Embedded System

Sophisticated Embedded System.

3. What are the various forms of system memories?

Internal RAM

Internal ROM / PROM / EPROM

External RAM

Internal Caches

E2PROM or flash memory

External ROM / PROM

RAM Memory buffers

Caches

4. What are the typical characteristics of an embedded system? April 2018, April 2017

Typical characteristics:

Perform a single or tightly knit set of functions;

Increasingly high-performance & real-time constrained;

Power, cost and reliability are often important attributes

That influence design;

Application specific processor design can be a significant component of some embedded systems.

Other characteristics:

- Application specific
- Digital signal processing in ECS
- Reactive and Real-time
- Distributed

5. Compare CISC and RISC processor.

CISC: Complex Instruction Set Computer (CISC) Aim of designing CISC processor is to reduce the software complexity by increasing the complexity of the processor architecture. CISC has large no of instructions. Instructions required to do a job is less and hence, the memory requirement is less. No. of registers are available in CISC processor is very less. Eg. Intel x86 family and Motorola 68000 series processors

RISC: Reduced Instruction Set Computer (RISC) RISC has limited no. of instructions and hence, complex operation is carried out through sequence of more simple instructions. Large number of registers is required in RISC processor. Another important feature of RISC processor is pipelined instruction execution. Embedded systems generally use RISC processor. Eg. ARM, ATMEL, AVR, MIPS, Microchip's PIC family processors, Power PC and Sun SPARC processor

6. What are the Steps involved in build process ? Nov 2016, May-2017

Definition: The process which converts source code to executable code is called as the build process

The build process involves three steps:

Compiling

Linking

Locating

7. What is DMA controller?

It facilitates a multi byte data transfer or Block of data transfer between the External device & System.

Modes of Operation:

1. Single Transfer at time & then release IO bus hold on the system bus after each transfer

2. Burst transfer at time & release of IO bus hold on the System Bus.

3. Bulk transfer & then release of IO bus hold on the System Bus after the Transaction is Completed.

8. Give Memory allocation Schemes in a system.?

Static Memory Allocation : Allocated during Compile Time... Entire space in memory is Allocated.

Dynamic Memory Allocation : Allocated during Run Time..... Blocks of Memory will be allocated.

9. What is Timer and counting devices?

A Timer gets the inputs from the internal clock of a processor or from system clock and generates a required time delay.

Counting device is a unit for getting the count-inputs on the occurrence of events that may be at irregular intervals.

10. What is Real Time Clock?

RTC is a clock that causes Occurrence of Regular intervals of interrupt on its each Ticks. Timing device once started never resets .It is Used in System to save Current time & Date.

11. What are the types of Timer?

There are two types of timer.

They are,

Hardware timer

Software timer

UNIT-2

1. Why device drivers are necessary for interfacing a device with a processor?

Nov 2016 May 2016

A system has number of physical devices. A device may have multiple functions. Each device function requires a driver. A common driver or separate drivers for each device function are required. It plays a key role in most embedded system as these provide software layers between application and devices. Drivers control almost all devices except the memory devices and processors in a system.

2. What is I2C? & Draw the data frame work of I2C- Nov 2017

I2C is a serial bus for interconnecting ICs .It has a start bit and a stop bit like an UART. It has seven fields for start,7 bit address, defining a read or a write, defining byte as acknowledging byte, data byte, NACK and end.

3. What is a CAN bus?

Controller–area network (CAN or CAN-bus) is a vehicle bus standard designed to allow microcontrollers and devices to communicate with each other within a vehicle without a host computer.

4. Give the Classification of Serial & Parallel port of IO devices. Nov -2017

Synchronous Serial Input

Synchronous Serial Output

Asynchronous Serial UART Input

Asynchronous Serial UART Output

Parallel Port one bit Input

Parallel One bit output

Parallel Port Input

Parallel Port Output

5. What are the Serial Bus Communicating Protocols? April 2017

I2C Bus, CAN Bus, USB Bus.

6. Define bus. April 2018

Buses: The exchange of information.

Information is transferred between units of the microcomputer by collections of conductors called buses. There will be one conductor for each bit of information to be passed, e.g., 16 lines for a 16 bit address bus. There will be address, control, and data buses.

7 .List some features of the CAN bus. April -2017, Nov 2016

It has a serial line, which is bi-directional. It receives or sent a bit at an instance by operating at the maximum rate of 1 Mbps. It employs a twisted pair connection to each node, which runs to a maximum of 40m.

8. What are the features of SPI? Nov 2016

- SPI has programmable clock rates
- Full-duplex mode
- Crystal clock frequency is 8MHz
- Open drain or totempole output from master to slave

9. Define device driver.

A device driver is software for controlling, receiving and sending byte or a stream of bytes from or to a device.

10. Compare Synchronous & Asynchronous communication.

In Synchronous Communication a Byte or Frame is Received or Transmitted at Constant Time interval with Uniform Phase difference .data is Sent at Fixed Time interval. Eg Frames sent over LAN . In Asynchronous Communication a Byte or Frame is Received or Transmitted at variable Time interval .Eg RS 232 Communication between two UART devices.

11. State the special features on I2C?

Low cost

Easy implementation

Moderate speed (up to 100 kbps).

12. What are disadvantages of I2C?

Slave hardware does not provide much support

Open collector drivers at the master leads to be confused

UNIT-3

1. Define EDLC.

EDLC is Embedded Product Development Life Cycle. It is an Analysis, Design, Implementation based problem solving approach for embedded systems development.

2. What are the objectives of EDLC?

The ultimate aim of any embedded product in a commercial production setup is to produce Marginal benefit.

EDLC has three primary objectives are:

- i. Ensure that high quality products are delivered to user
- ii. Risk minimization defect prevention in product development through project management
- iii. Maximize the productivity

3. What are the different types of EDLC models?

1. Waterfall or Linear Model
2. Iterative/ Incremental or Fountain Model
3. Prototyping Model
4. Spiral Model

4. List the different phases of EDLC April 2017

1. Need
2. Conceptualization
3. Product Scope
3. Analysis
4. Design
5. Development and Testing
6. Deployment
7. Support

- 8. Upgrades
- 9. Retirement/Disposal

5.. What are the process involved in Co-design Nov 2016, May 2016

System specification

- Models,
- Architectures,
- LanguagesHW/SW partitioning
- Architectural assumptions:Type of processor, interface style,
- Partitioning objectives: Speedup, latency requirement, silicon size, cost, etc
- Partitioning strategies:High-level partitioning by hand, computer-aided partitioning technique, etc.
- HW/SW estimation methods HW/SW synthesis
- Operation scheduling in hardware
- Instruction scheduling in compiler
- Process scheduling in operating systems
- Interface Synthesis
- Refinement of Specification

6. Compare dataflow model and Finite state model. April 2018

- Both Dataflow and Finite State Machine are models of computation.
- The Dataflow model of computation is used extensively in signal processing design and is particularly convenient for numeric-intensive computation of applications. Dataflow graphs are widely accepted for modelling DSP algorithms such as multimedia, signal processing.
- FSMs have been developed to solve a different class of problems, namely sequential control.
- FSMs are an appropriate modeling approach for control-dominant applications like real-time process controllers

7.What are the activities performed during Conceptualization phase of EDLC?

1. Feasibility Study
2. Cost Benefit Analysis (CBA)
3. Product Scope
4. Planning Activities

8.What are the various types of testing performed in a product development?

- Unit testing
- Integration testing
- System testing
- User acceptance testing

9.Define Preliminary Design Document (PDD).

The design phase identifies application environment and creates an overall architecture for the product. It starts with the Preliminary Design. It establishes the top level architecture for the product. On completion it resembles a 'black box' that defines only the inputs and outputs. The final product is called Preliminary Design Document (PDD).

10. Define Data Flow graph (DFG) Nov 2017

- A program is modelled as handling the input data streams and creating output data streams.

- A data-flow means that a program flow such that specifically the data only determines all the program execution steps and program flows are determined specifically only by the data.

11. What are the computational models in Embedded design? May 2016

- Data Flow graph Model
- Sequential Program Model

UNIT IV

Two Marks

1. Define RTOS.

A real-time operating system (RTOS) is an operating system that has been developed for realtime applications. It is typically used for embedded applications, such as mobile telephones, industrial robots, or scientific research equipment

2. Compare the difference between RTOS and Operating System.

A regular OS focuses on computing throughput while an RTOS focuses on very fast response time. OS are used in a wide variety of applications while RTOSes are generally embedded in devices that require real time response. OS use a time sharing design to allow for multi-tasking while RTOSes either use a time sharing design or an even driven design. The coding of an RTOS is stricter compared to a standard OS

3. List the functions of a kernel.

- Process management
- Process creation to deletion
- Processing resource requests
- Scheduling
- IPC Memory management
- I/O management
- Device management

4. Define process. May 2016

Process is a computational unit that processes on a CPU under the control of a scheduling kernel of an OS. It has a process structure, called Process control block. A process defines a sequentially executing program and its state.

5. What is a thread? May 2016

Thread is a concept in Java and UNIX and it is a light weight sub process or process in an application program. It is controlled by the OS kernel. It has a process structure, called thread stack, at the memory. It has a unique ID. It has states in the system as follows: stating, running, blocked and finished.

6. What are the three methods by which an RTOS responds to a hardware source? 6. What are the three methods by which an RTOS responds to a hardware source call on interrupt?

- Direct call to ISR by an interrupt source
- Direct call to RTOS by an interrupt source and temporary suspension of a scheduled task.
- Direct call to RTOS by an interrupt source and scheduling of tasks as well as ISRs by the RTOS.

7. Define Mailbox and Pipe.

A mailbox is a software-engineering component used for interprocess communication, or for inter-thread communication within the same process. A mailbox is a combination of a semaphore and a message queue (or pipe). Message queue is same as pipe with the only difference that pipe is byte oriented while queue can be of any size.

8. What is preemptive and non-preemptive scheduling? Nov 2016 may 2016

- Under non-preemptive scheduling once the CPU has been allocated to a process, the process keeps the CPU until it releases the CPU either by terminating or switching to the waiting state.
- Preemptive scheduling can preempt a process which is utilizing the CPU in between its execution and give the CPU to another process.

9. What is priority inheritance?

Priority inheritance is a method for eliminating priority inversion problems. Using this programming method, a process scheduling algorithm will increase the priority of a process to the maximum priority of any process waiting for any resource on which the process has a resource lock.

10. Define Inter process communication.

An output from one task passed to another task through the scheduler and use of signals, exception, semaphore, queues, mailbox, pipes, sockets, and RPC.

11. Define Semaphore. Nov 2017

Semaphore provides a mechanism to let a task wait till another finishes. It is a way of synchronizing concurrent processing operations. When a semaphore is taken by a task then that task has access to the necessary resources. When given the resources unlock. Semaphore can be used as an event flag or as a resource key.

UNIT-5

1. List any four application of Microcontroller operating system MUCOS April 2018

MUCOS is widely used in many fields such as

cameras

Automotive electronics

medical devices

Aerospace

Networking

2. Classify Electronics control unit (ECU). Give its uses April 2018

ECU is Classified into.

High speed Electronics Control Units

Low Speed Electronics Control Units

High speed Electronics Control Units – These units are deployed in critical control units requiring fast response like fuel injection systems, anti-lock brake systems

Low Speed Electronics Control Units – These units are deployed in applications where response time is not so critical. They are generally built around low cost microprocessor/ Microcontroller and DSP. Audio controllers, door locks, door glass controls.

3. Mention any 4 Real time embedded processor based applications? Nov 2017

- i) Digital Control
- ii) Signal processing
- iii) Telecommunication systems and
- iv) Defense

Air conditioner, TV remote or music player, Bus reservation, automated teller machine in a bank, Air Traffic Control, Medical application

4. What are the basic requirements while designing an embedded system? Nov 2017

- Requirement definition.
- System specification.
- Functional design
- Architectural design
- Prototyping.

5. List some applications of embedded systems. May 2016, Nov 2016 April 2017

Consumer Electronics- Camcorders, cameras etc

Household appliances- Television, DVD players, washing machine, Microwave ovens

Home automation- Air conditioners, Intruders Detection systems, Fire alarms

Automotive industry- Anti-lock Braking systems, engine control, ignition systems, automatic navigation

Telecommunication- Cellular telephones, Hand set Multimedia applications

Health care- EEG, ECG Machine. etc

Banking- ATM,

Measurement & Instrumentation- Digital Multimeter, digital CRO, Logic analyzer, etc

Card Readers- Smart card Readers, hand Held Devices .etc

6. What are the events involved in the Smart card application? May 2016, Nov 2016

Rest Task

task_ReadPort

task_PW

task_Appl

7. Draw the system components in the Smart card April 2017

