

UNIT-1**INTRODUCTION TO EMBEDDED SYSTEM****PART-A**

1.What is meant by embedded system?

An embedded system is a large or small computer system that is build upn into a product a piece of equipment or another computer system and that performs some task useful to the prouct equipment or system.

2.List the components of embedded system?

It embeds hardware similar to a computer the units in the hardware of a computer the units in the hardware of an embedded system. As its software usually do no need a secondary hard disk and CD memory as in a computer.

It embeds main application software.The application software may concurrently perform a series of tasks or processes or threads.

3.List the characteristics of embedded system.

Complex algorithm

User interface

Real time

Multirate

Manufacturing cost.

4.List the some of the examples of embedded system.

Embedded system have very diversified applications such as smart cards,missiles and satellites,computer networking,digital consumer electronics and automotives.At the applications of embedded systems in these areas.

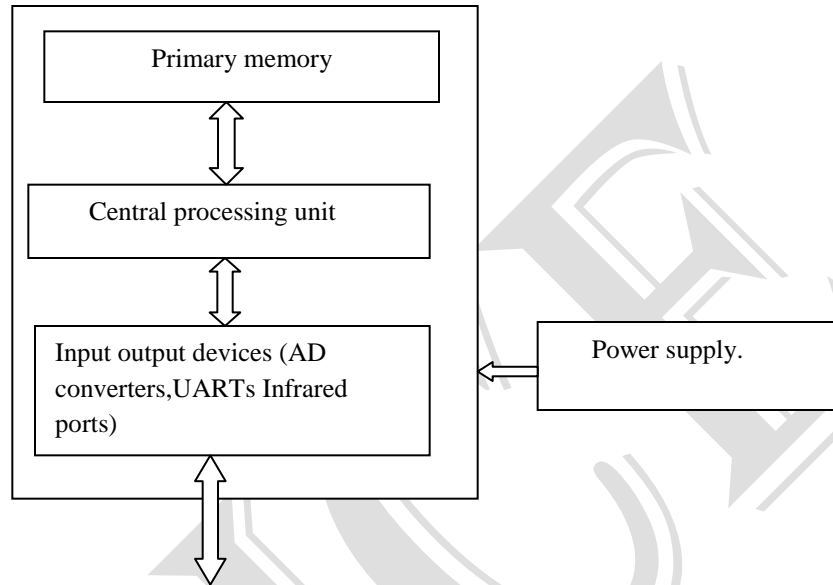
A few applications are in small embedded system applications are:

- Keyboard controller.
- SD,MMI and network access cards.
- Washing or cooking systems.
- Multitasking tays.

5.What are the major steps in the embedded system design process?

In this top down view we start with the system requirements. In the next step specification we create a more detailed description of what we want but the specification states only how the system behaves not how it is built.

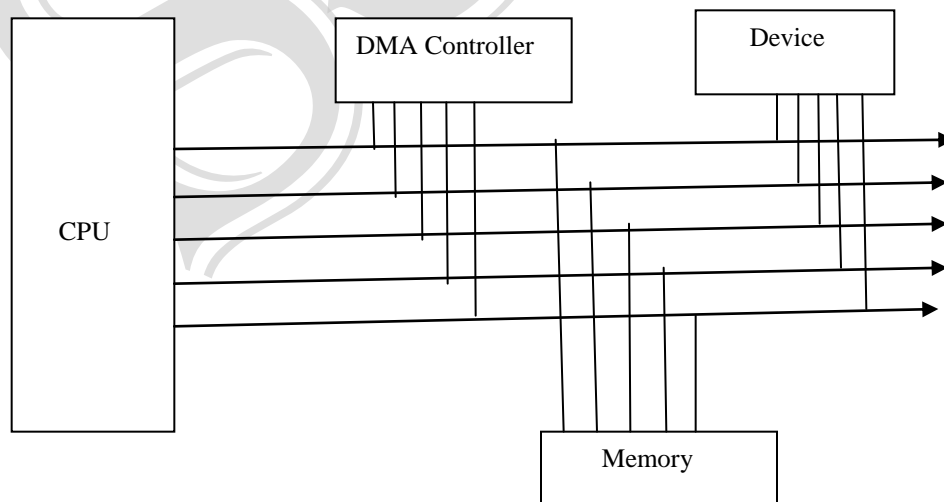
6.Sketch the structure of embedded system.



7.What are the processor selection condition for an embedded system?

The processor selection process can be understood by considering four representative cases.First a design table is build.A processor having the required structural units and capable of giving the desired processor performance in system is then chosen.

8.What is DMA?



Direct memory access is a bus operation that allows read and write not controlled by the CPU. A DMA transfer is controlled by DMA controlled, which request control by the bus from CPU.

9.What is meant by timing and counting device?

- 1) It counts (the input due to the events at irregular instances)
- 2) It counts the clock input or a status bit in the timing device register controls the mode as timer or counter.

10. What is meant by watchdog timer?

A watchdog timer, a simply a watchdog is a hardware timer for monitoring the firmware execution. Depending on the internal implementation,the watchdog timer increments free running counter.

11. List out the challenges in building an embedded system.

Manufacturing cost.

Performance (both overall speed and deadlines)

Power consumption.

12.List out the working components of washing machine.

Display unit

Sensor

Water level sensor.

Door sensor.

Driving motor.

13.Define system.

A system is a way of working,organizing or doing one or many tasks according to a fixed plan,program or set of rules.A system also an arrangement in which all its units assemble and work together to plan or program.

14.why we are using microprocessor in an embedded system?

A microprocessor is used as general purpose processor when large embedded software has to be located in the external memory chips.

15.Define virtual memory.

Virtual memory is the concept by which the application is made to believe that it has much more memory than is physically available.

16.What are the various forms of system memory used?

- Flash/EEPROM
- ROM/PROM
- External RAM chips
- Internal caches at microprocessor
- Internal RAM at micro controller.

17.Define DMA controller.

A device that facilitates DMA transfer has a processing element is called DMA controller or DMAC.

18.List out the uses of DMAC.

- Read or write.
- Mode of DMA transfer
- Total number of bytes to be transferred
- Starting memory address.

PART-B

1.List and explain the hardware units that must be present in the embedded systems.

2.Explain the various form of memories present in an embedded system.

3.Discuss about In-circuit emulator and watch dog timer.

4.With a neat diagram,explain the working of Direct memory access(DMA).

5.Discuss about the structural units in embedded processor and how a processor is selected for an embedded application.

UNIT-II**EMBEDDED NETWORKING****PART-A**

1.What is ENS?

ENS networks provide distributed network and internet access to sensors,controls and processors embedded in equipment, facilities and the environment. Integrated technology now enables the constructions of sensors ,radius and processors at low cost and with low power consumption.\

2.What are the types of IO buses?

Embedded systems connected internally on the same IC or systems at very short and long distances and can be networked using following types of IO buses,each buses functioning according to specific protocols.

3.List the characteristics to be considered when interfacing a device port.

- A port may have provision for multiplexed output to connect to multiple systems or units.
- A port may have provision for demultiplexed inputs from multiple systems or units.

4.What are the characteristics of synchronous communication are as follows?

- Bytes maintain a constant phase difference.It means they are synchronous that is in synchronization.There is no permission for sending either the bytes or the frames at random time intervals.
- A clock ticking at a certain rate must always be there to serially transmit the bits of all the bytes.

5.List the various methods by which synchronous signals with clocking information.

- Frequency modulation
- Mid frequency modulation
- Manchester coding
- Quadrature amplitude modulation
- Bi-Phase coding.

6.What are the characteristics of asynchronous communication?

- Bytes need not maintain a constant phase difference and are asynchronous that is not in synchronization.Bytes or frames can be sent at variable time intervals.
- Though the clock must lick at a certain rate to transmit bits of a single byte serially,it is always implicit to the asynchronous data receiver.

7.List the SPI protocols.

- MOSI – MOSI signal is generated by master recipient is the slave.
- MISO – Slaves generate MISO signals and recipient is the master.
- SCLK – SCLK is a signal generated by the master to synchronize data transfer between master and slave.

8.What is CAN bus?

CAN is a serial bus for interconnecting central control network.It is widely used in automobiles.It has fields for bus arbitration bits,control bit for address and data length, data bits, CRC check bits,acknowledgement bits and ending bits.

9.What is FC bus?

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

10.What is USB bus?

USB is a serial bus that interconnects a system.It attaches and detaches a device from the network.It uses a root hub.Nodes containing the devices can be organized like a tree structure wireless USB is used for remote connections without wires.

11.What are the addresses allocated in ISA?

- Addresses allocates are 0X000-0X00F for DMA chip 8237. The addresses for other devices are as follows.
- The addresses allocated are hex 2F8-2FF and 3F8-3FF for IBM COM ports.
- Synchronous data link control addresses allocated are between hex 380-38C.

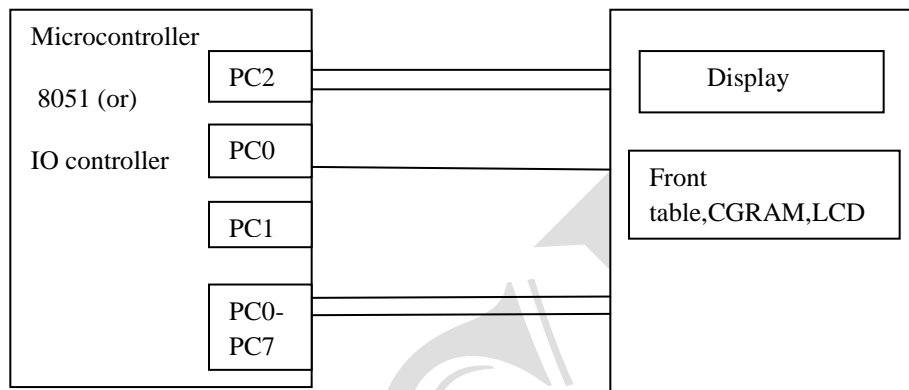
12.Enumerate the format of bits used in I²C bus.

FIELD AND ITS LENGTH	EXPLANATION
First field of 1 bit	It is start bit similar to the one in a UART
Second field of 7 bits	It is called address field. It defines the slave address being sent the data frame by minister.
Third field of 1 control bit	It defines whether a read or write cycle is in progress

13.What is meant by EISA?

EISA bus is a 32-bit data and address lines version of ISA and devices this bus for IOs are also supported.An EISA device driver first checks the EISA bus availability on the hosting computer or system.

14.Sketch the parallel port interfacing with LCD controller.



15.What is COM ports?

It is a port at the computer where a mouse,modem,serial printer or mobile serial printer or mobile smart phone cradle connects for serial IOs in UART mode and there are handshaking signals for exchange of signal before UART mode communication.

16.Name the device drivers classification.

- Block device drivers
- Character device drivers
- Network device drivers.

17.List out the different standard version for CAN?

- Low speed CAN-125Kbps-11 bit identifier
- Standard CAN 2.0A-1mbps-11 bit identifier
- External CAN 2.0B-1mbps-29 bit identifier

18.What is need for device driver?

Most embedded hardware requires some type of software initialization and management. The software that directly interfaces with and controls this hardware is called device driver.

PART-B

- 1.Explain in detail about SPI communication protocol and its interfacing techniques.
- 2.What are the necessary sketches to enable intra communications among peripherals using I²C bus.
- 3.Write short notes on:
 - i)232 standard ii) CAN bus iii) Inter Integrated circuit bus.

SUCCE

UNIT-III

EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT

PART-A

1.What is EDLC?

Embedded development life cycle is an Analysis-Design-Implementation based problem solving approach for the product development.

ANALYSIS- What product need to be developed.

2.What are the objectives of EDLC?

- 1) Ensure that high quality product are delivered to and user.
- 2)Risk minimization and defect prevention in product development through project management.
- 3) maximize the productivity .

3.List various types of testing performed in EDLC.

1. Unit testing – testing each unit or module of the product indpendly for required functionality and quality aspects.
2. Intergration testing-integrating each modules and testing the integrated unit for required functionality.

4.What are the various requirements to be considered in requirement analysis phase?

- 1.Functional capabilites like performances, operational characteristics.
2. Data requirements.
- 3.User manuals
- 4.Operational requirements.

5. What are the principles to be taken in cost benefit analysis?

Common unit of measurement . In order to make the analysis and meaningful. All aspects of the product,either plus point or minus points should be expressed in terms of a common unit.

6. List the UML building blocks.

Things Relationships diagram are the fundamental building blocks of UML.

7. What is product re-engineering?

The embedded product market is dynamic and competitive. In order to sustain in the market the product developer should be aware of the general market trends technology changes and the taste of the end.

- Change in business requirements
- User interface enhancements.

8. What is concurrent process model?

The concurrent or communicating process model concurrently executing tasks process. Sequential leads to a single sequential execution of task and there by leads to poor processor utilization.

9. what is product maintenance ?

Product maintenance 'need' deals with providing technical support to the and user for an existing product in the market. The maintenance request may come as a result of product non-functioning or failure.

10. What are different phases of EDLC?

EDLC has following different phases.

- 1) Need
- 2) conceptualization
- 3) Analysis
- 4) design
- 5) development and testing.

11. What is meant by testing phase?

Testing phase is a phase which deals with the execution of various tests like integration testing, system testing, user acceptance testing etc.

12. What are the different types of product development needs?

Product development needs has following types.

1. New or custom product development
2. Product re-engineering
3. Product maintenance

13. What is hardware software co-design?

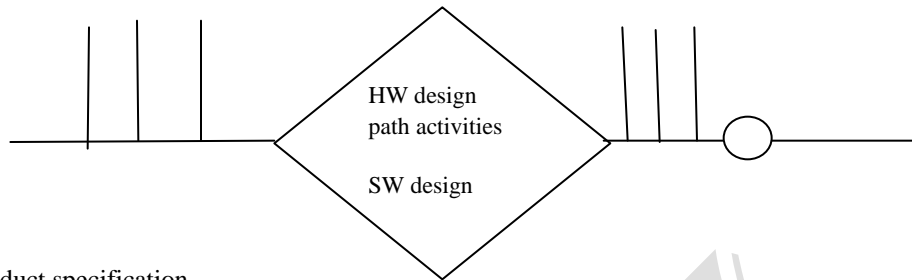
Hardware software co-design is the modern for interactive together design of hardware and firmware for embedded systems.

14. What are the processes involved in co-design?

- Selecting the model
- Selecting the architecture

✓ Controller architecture, Data path architecture, CISC, VLIW

15.What are the phases of EDLC?



Phase-1 Product specification

Phase-2 HW/SW partition

Phase-3 Iteration and implementation

Phase-4 Detailed HW/SW design

Phase-5 HW/SW Integration.

PART-B

- 1.Illustrate with functional description about the different phases of embedded design life cycle model.
2. With a suitable example,explain about the state machine model of a automatic chocolate vending machine.

UNIT-IV**RTOS BASED EMBEDDED SYSTEM DESIGN****PART-A**

1.What is kernel and its services?

The kernel is the core of the operating system and is responsible for managing the system resources and the communication among the hardware and other system services.

- Process management
- Primary memory management
- File system management.

2.What is real time kernel and its basic functions?

The kernel of a real time operating system is referred as real time kernel. In complement to the conventional OS kernel,the real time kernel is highly specialized and it contains only the minimal set of running user application/tasks.

- Memory management
- Time management
- Task/process management.

3.Define process.

A process is a program or part of it in execution process is also known as an instance of a program in execution.Multiple instances of the same program can execute simultaneously.

4.Define Thread.

A thread is the primitive that can execute code AA thread is a single sequential flow of control within a process. 'Thread' is also known as light weight process and many threads of execution.

5.What are the advantages of of using multiple threads?

- Better memory utilization.Multiple threads of the same process share the address space for data memory.
- Efficient CPU utilization.The CPU is engaged all time.

6.What is multiprocessing and multitasking?

The terms multiprocessing and multitasking are a little confusing and sounds a like. In the operating system context multiprocessing describes the ability to execute multiple process simultaneously systems which are capable of performing multi processing is known as multi processor systems.

The ability of the operating system to have multiple program in memory, which are ready for execution from one process to another process is known as multitasking.

7. Define context switching and context retrieval.

Process is identical to the physical process in the sense it has own register set which mirrors the CPU registers, stack and program counter. Hence a process is considered as a 'VIRTUAL PROCESSOR' awaiting its turn to have its properties switched into physical processor.

8. List the types of multitasking.

- Co-operative multitasking
- Preemptive multitasking
- Non-Preemptive multitasking

9. What are the queues used in CPU scheduling?

The various queues maintained by OS in association with CPU scheduling are:

- Job queue
- Ready queue
- Device queue

10. What is meant by non preemptive scheduling?

Non-preemptive scheduling is employed in systems which implement non-preemptive multitasking model. In this scheduling type, the currently executing task is allowed to run until it terminates or enters the 'WAIT' state waiting for an I/O system resource.

- First come first served
- Last come first served
- Shortest job first scheduling.

11. What is preemptive scheduling?

Preemptive scheduling is employed in systems which implements preemptive multitasking model. In preemptive scheduling every task in the ready queue get a chance to execute.

12. How the process running on OS classified?

In a multitasking system multiple task run concurrently and each process may or may not interact between. Based on the degree of interaction the processes running on OS are classified as

Co-operating processes, Competing processes, Co-operation through sharing.

13. Define deadlock with example.

A race condition produces incorrect results whereas a deadlock condition creates a situation where none of the processes are able to make any progress in their execution, resulting in a set of deadlocked processes.

14. What are the non functional requirement for choosing RTOS?

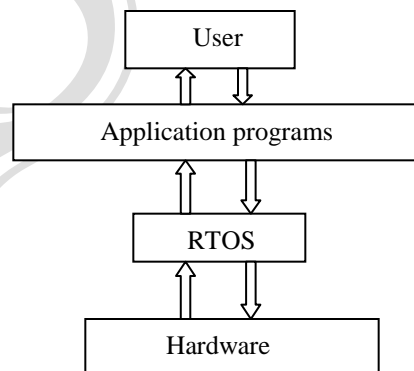
- Custom developed of the shelf
- Cost
- Base of use
- After sales
- Development and debugging tools availability.

15. What are the consideration to be taken in deadlock?

- Mutual exclusion
- Hold and wait
- No resource preemption
- Circular wait
- Deadlock handling
- Ignore deadlocks.

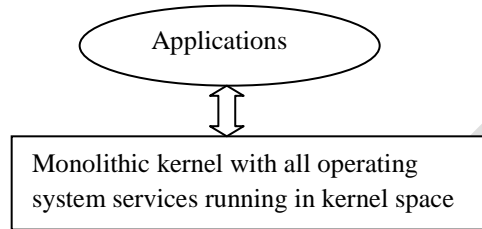
16. What is real time system?

Real time system: A real time system is a computer system in which the correctness of the system behavior depends not only on the logical results of the computation but also on the physical instant at which these results are produced.



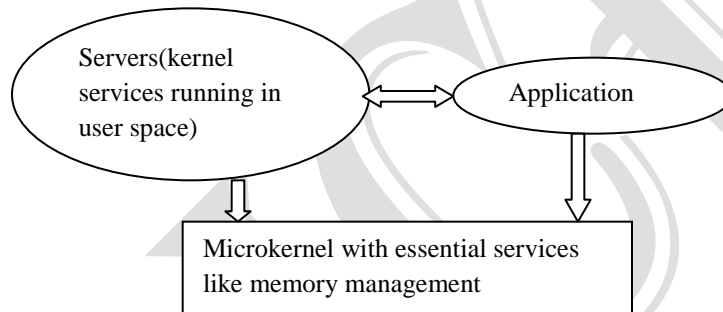
17.What is micro kernel?

In monolithic kernel architecture all kernel services run in the kernel space.Here all kernel modules within the same memory space under a single kernel thread.

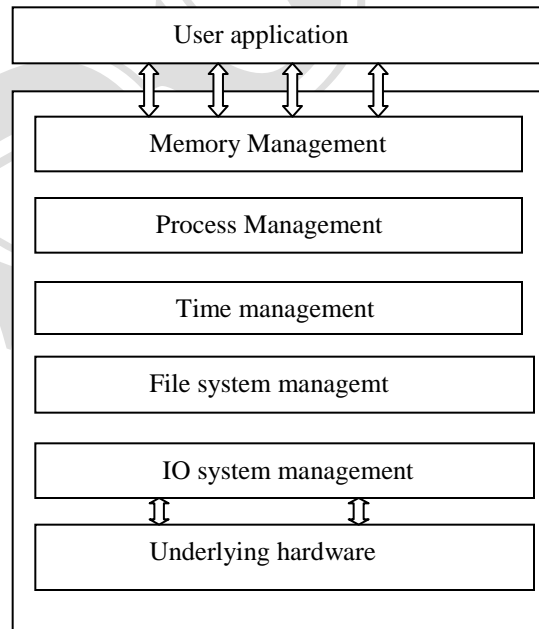


18.What is microkernel?

The microkernel design incorporates only the essential set of operating system services into the kernel.The rest of operating system services are implemented in programs known as 'servers' which runs in user space.



19.Sketch the OS architecture.



PART-B

- 1.Explain how the interrupt routines are handled by RTOS and illustrate features of Vx works.
- 2.Explain the terminologies semaphores,mailbox,pipes and shared memory RTOS.
- 3.Explain in detail about the interprocess communication and context switching.

SUCCESS

UNIT-V**EMBEDDED SYSTEM APPLICATION DEVELOPMENT****PART-A**

1.List the components of washing machine?

- Display panel
- Sensor
- Water level sensor
- Door sensor
- Driving sensor

2.Enumerate the sequence of washing the clothes.

- Put on your dirty clothes on to wash tub for washing.
- Put on the detergent soap
- Switch ON the tap,water rushes inside tup.
- Electronic control,then press keys you could program mechanical it shall something like an mechanical switches where in you allow to wash the clothes and gives you a beep sound.
- Now your clothes are washed,remove it from the wash tub and put it on the spin tub and program it accordingly after spinning clothes are dried and you allowed for proper drying in sunlight.

3.List the applications of embedded system.

AREA	APPLICATIONS
AEROSPACE	Navigation systems, automotive landing systems, flight altitude control, engine control.
AUTOMOTIVE	Fuel injection control, anti lock braking systems, OPS mapping
INDUSTRIAL	Elevator controls, Robots, Engine control

4.List the general features of automotive embedded system.

- High reliability and safety requirements.
- Severe production cost restriction
- Cost and weight reduction
- Safety(active and passive)

5.What are the classification of automotive embedded system?

- Powertrain and classic control
- Body electronics
- Multimedia application
- Integrated systems/services.

6.What is ABS?

An antilocking braking system is an automobile safety system that allows the wheel on a motot vehicle to maintain tractive contact with the road surface according to driver inputs while braking,preventing the wheels from locking up and avoiding uncontrolled skidding.

7.How does the car navigation system known a car's location?

Car navigation systems receive signals from satellites and identify the vehicle's position and direction by combining that data with information obtained from various on board sensors.

8.What are the components present in airbag system?

There are 3 main components to your airbag system the bag,the inflator and the sensor.The sensor must register a collision force roughly equal to hitting a brick wall at 10 to 15 mile per hour before it trigger airbag inflation.

9.What are the problems faced in automotive embedded system?

- Complicated system design
- Large scale and complicated software
- Too large number of ECUs
- Complicated network architecture.

10.What are the events involved in the smart card application?

A smart card is a flexible plastic card,usually made of PVC that contains one or more embedded integrated circuits.The integrated circuit is an smart card often in it.

PART-B

- 1.With suitable diagram explain in detail about the concept of washing machine application?
- 2.Elucide the selection of processor and memory for any one embedded applications with suitable diagram in detail.
- 3.Write suitable diagram explain in detail about the concept of smart card system application.

SUCCE