UNIT-IV

HARDWARE ACCELETRATES AND NETWORKS

TWO MARKS

1. Differentiate synchronous communication and iso-synchronous communication.

Synchronous communication

When a byte or a frame of the data is received or transmitted at constant time intervals with uniform phase difference, the communication is called synchronous communication.

Iso-synchronous communication

Iso-synchronous communication is a special case when the maximum time interval can be varied.

2. What are the two characteristics of synchronous communication? Bytes maintain a constant phase difference

The clock is not always implicit to the synchronous data receiver.

3. What are the three ways of communication for a device?

Iso-synchronous communication
synchronous communication
Asynchronous communication

4. Expand a) SPI b) SCI

SPI—serial Peripheral Interface

SCI—Serial Communication Interface

5. Define software timer.

This is software that executes and increases or decreases a count variable on an interrupt from a timer output or form a real time clock interrupt. A software timer can also generate interrupt on overflow of count value or on finishing value of the count variable

3. What is I2C?

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.

4. What are the bits in I2C corresponding to?

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

5. What is a CAN bus? Where is it used?

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

6. What is USB? Where is it used?

USB is a serial bus for interconnecting 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. It is mostly used in networking the IO devices like scanner in a computer system.

7. What are the features of the USB protocol?

A device can be attached, configured and used, reset, reconfigured and used, share the bandwidth with other devices, detached and reattached.

8. Explain briefly about PCI and PCI/X buses.

PCI and PCI/X buses are independent from the IBM architecture .PCI/X is an extension of PCI and support 64/100 MHZ transfers. Lately, new versions have been introduced for the PCI bus architecture.

9. Why are SPCI parallel buses important?

SPCI serial buses are important for distributed devices. The latest high speed sophisticated systems use new sophisticated buses.

10. What is meant by UART?

UART stands for universal Asynchronous Receiver/Transmitter.

UART is a hardware component for translating the data between parallel and serial interfaces.
UART does convert bytes of data to and from asynchronous start stop bit.
UART is normally used in MODEM.

11. What does UART contain?

A clock generator.
Input and Output start Registers
Buffers.
Transmitter/Receiver control.

12. What is meant by HDLC?

HDLC stands for "High Level Data Link Control".
HDLC is a bit oriented protocol.
HDLC is a synchronous data Link layer.

13. Name the HDLC's frame structure?

Flag	Address	Control	Data	FCS	Flag

14. List out the states of timer?

There are eleven states as

follows

Reset state
Idle state
Present state
Over flow state
Over run state
Running state
Reset enabled state / disabled
Finished state
Load enabled / disabled
Auto reload enabled / disabled
Service routine execution enabled / disabled

15. Name some control bit of timer?

Timer Enable
Timer start
Up count Enable
Timer Interrupt Enable

16. What is meant by status flag?

Status flag is the hardware signal to be set when the timer reaches zeros.

17. List out some applications of timer devices?

Real Time clock
Watchdog timer
Input pulse counting
TDM
Scheduling of various tasks

18. State the special features on I^2C?

Low cost
Easy implementation
Moderate speed (upto 100 kbps).

19. What are disadvantages of I^2C?

Slave hardware does not provide much support
Open collector drivers at the master leads to be confused

20. What are the two standards of USB?

USB 1.1
USB 2.0

21. Draw the data frame format of CAN?

Start	Arbitration field	Control field	Data field	CRC field	Acknowledgement field	End of frame
1	12	6	0-64	16	2	7

22. What is the need of Advanced Serial High Speed Buses?

If the speed in the rate of 'Gigabits per second' then there is a need of Advanced Serial High Speed Buses.

23. What is meant by ISA?

ISA stands for Industry standard Architecture.
Used for connecting devices following IO addresses and interrupts vectors as per IBM pc architecture.

24. What is meant by PCI-X?

PCI X offers more speed over PCI.
30 times more speed than PCI.

25. Define CPCI?

CPCI stands for Compact peripheral component Interfaces.
CPCI is to be connected via a PCI.
CPCI is used in the areas of Telecommunication Instrumentation abd data communication applications.

26. Define half-duplex communication.

Transmission occurs in both the direction, but not simultaneously.

27. Define full duplex communication.

Transmission occurs in both the direction, simultaneously

28. Define Real Time Clock (RTC)?

Real time clock is a clock which once the system stats does not stop and cant be reset and its count value cant be reloaded.

29. Define Time-out or Time Overflow?

A state in which the number of count inputs exceeded the last acquirable value and on reaching that state, an interrupt can be generated.

30. Why do we need at least one timer in an ES?

The embedded system needs at least on timer device. It is used as a system clock.

16 MARKS

1. Explain the parallel port

devices. Parallel Port I/O devices

In this communication any number of ports could be connected with the device and the data communication is bidirectional in nature.

1. Single Bit Input and Output

Parallel Port Single Bit Input
Parallel Port Single Bit Output

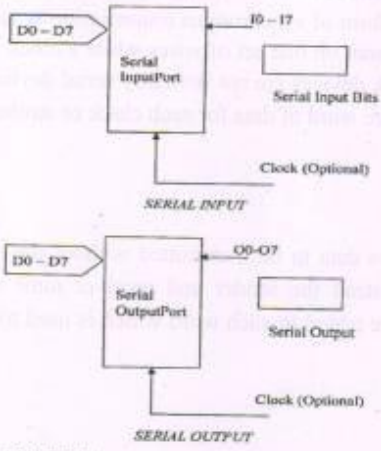
2. Parallel Port input and Output

Parallel Port Input
Parallel Port Output

Diagrams:

i) Parallel input port, output port and a bidirectional port for connecting the device

ii) The handshaking signals when used by the I/O ports.



Characteristics taken into consideration when interfacing a device port.

Synchronous Serial I/O devices

Synchronous Serial communication is defined as a Byte or a Frame of data is transmitted or received at constant time intervals with uniform phase differences.

Synchronous Serial Input Devices
.Synchronous Serial Output Devices

2. Explain the sophisticated interfacing features in device

ports. Schmitt trigger

Data Gate
HSTL,SSTL
XCITE
Multigigabyte Transceivers
SerDes
Multiple I/O standards
PCS
PMA

3. Explain the types of UART

UART - Universal Asynchronous Receiver Transmitter
USART Universal Synchronous Asynchronous Receiver Transmitter

Synchronous Serial Transmission

Synchronous serial transmission requires that the sender and receiver share a clock with one another, or that the sender provides a strobe or other timing signal so that the receiver knows when to "read the next bit of the data. A form of synchronous transmission is used with printers and fixed disk devices in that the data is sent on one set of wires while a clock or strobe is sent on a different wire. Printers and fixed disk devices are not normally serial devices because most fixed disk interface standards send an entire word of data for each clock or strobe signal by using a separate wire for each bit of the word.

Asynchronous Serial Transmission

Asynchronous transmission allows data to be transmitted without the sender having to send a clock signal to the receiver. Instead the sender and receiver must agree on timing parameters in advance and special bits are added to each word which is used to synchronize the sending and receiving units.

When a word is given to the UART for Asynchronous transmissions, a bit called the "Start Bit" is added to the beginning of each word that is to be transmitted.

After the Start Bit, the individual bits of the word of data are sent, with the Least Significant Bit (LSB) being sent first.

Each bit in the transmission is transmitted for exactly the same amount of time as all of the other bits and the receiver look at the wire at approximately through the assigned to each bit to determine if the bit is a 0 or 1.

The sender does not know when the receiver has "looked" at the value of the bit. The sender only knows when the clock says to begin transmitting the next bit of the word.

When the entire data word has been sent, the transmitter may add a Parity Bit that the transmitter generates.

The Parity Bit may be used by the receiver to perform simple error checking. Then at least one Stop Bit is sent by the transmitter.

the receiver has received all of the bits in the data word. It may check for the Parity Bits (both sender and receiver must agree on whether a Parity Bit is to be used) and then the receiver looks for a Stop Bit. If the Stop Bit does not appear when it is supposed to the UART considers the entire word to be garbled and will report a Framing Error to the host processor when the data word is read. The usual cause of a Framing Error is that the sender and receiver clocks were not running at the same speed, or that the signal was interrupted.

Regardless of whether that data was received correctly or not, the UART automatically discards the Start, Parity and Stop bits. If the sender and receiver are configured identically, these bits are not passed to the host.

4. Describe in detail about Synchronous, ISO-Synchronous and Asynchronous communication for serial device.

Synchronous

In this means of communication, byte or frame of data received and transmitted at constant time intervals with uniform phase differences. Bits of a data frame are sent in a fixed maximum time intervals. Handshaking between sender and receiver is not provided during communication.

Example

Frames sent over LAN.

Characteristics

The main features of the synchronous communication are

Bytes maintain a constant phase difference. No sending of bytes at random time intervals.

A clock must be present at transmitter to send the data Moreover, the clock information is sent to the receiver (i.e.) it is not always implicit to the receiver.

Communication Protocols used

Most often synchronous serial communication is useil for
Data is transmission between physical devices.
It can be complex and has to be as per the communication
Protocol followed.
Example., HDLC (High Level Data Link Control)

Synchronization ways

Ten ways by which the synchronous signals with the clocking info transmitted from transmitter to the receiver are as shown below.

Iso-Synchronous

Iso-synchronous communication is a special case of synchronous communication. In contrast with the synchronous communication where bits of data frame are sent in a fixed maximum time interval, the iso=synchronous communication may have varied maximum time intervals.

Asynchronous

In the asynchronous communication a Byte or a Frame of data is received or sent at variable time intervals with phase difference.

The data is sent as a series of bits. A shift register (in either hardware or software) is used to serialize each information byte into the series of bits which are then sent on the wire using an I/O port and a bus driver to connect to the cable

Characteristics

Bytes or Frames of data is sent or received at variable time intervals.
Handshaking between sender and receiver is provided during communication.
A clock is needed at the transmitter to send the data'
The clock data is not sent to the receiver (i.e) it is always ' implicit to the receiver.

5. Give some Examples of Internal Serial

Communication a. Common USART like Device in 8051

There will be a common USART like hardware device in 805 1.
USART - Universal Synchronous and Asynchronous.
Receiver and Transmitter
It is also called as SI (Serial Interface)

Features

i. SCON - Saves Control and status flags in SI
ii. SFR - Special Function Register
iii. SBUF - Serial Buffer

SI Operates in two modes

i. Half Duplex Synchronous mode of operation
ii. Full Duplex Asynchronous mode of operation

b. SPI and SCI: Serial Peripheral Interface (SPI)

It has full duplex feature for asynchronous communication It has a feature of programmable rates for clock bits.
It is also programmable for defining the –instance of the occurrence to negative and positive edges within intervals of bits. Devices selection is also programmable

Serial Communication Interfaces (SC I)

UART asynchronous (SCD baud rates are same as SPI but not programmable.
Communication is in full duplex

Characteristics

A port device may have multi byte data input buffer and output buffer A port may have a DDR.
Port may have LSTTL driving capability and port loading capability Multiple functionality in ports

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Protocol

Most often synchronous serial communication is used for
Data is transmission between physical devices.
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6. Explain Memory & IO Devices Interfacing (Memory Mapped I/O)

I/O operations are interpreted differently depending on the viewpoint taken and place different requirements on the level of understanding of the hardware details.

From the perspective of a system software developer, I/O operations imply communicating with the device, programming the device to initiate an I/O request, performing actual data transfer between the device and the system, and notifying the requestor when the operation completes. The system software engineer must understand the physical properties, such as the register definitions, and access methods of the device. Locating the correct instance of the device is part of the device communications when multiple instances of the same device are present.

The system engineer is also concerned with how the device is integrated with rest of the system. The system engineer is likely a device driver developer because the system engineer must know to handle any errors that can occur during the I/O operations.

From the perspective of the RTOS, I/O operations imply locating the right device for the I/O request, locating the right device driver for the device, and issuing the request to the device driver. Sometimes the RTOS is required to ensure synchronized access to the device.

The RTOS must facilitate an abstraction that hides both the device characteristics and specifics from the application developers. From the perspective of an application developer, the goal is to find a simple, uniform, and elegant way to communicate with all types of devices present in the system. The application developer is most concerned with presenting the data to the end user in a useful way.

The combination of I/O devices, associated device drivers, and the I/O subsystem comprises the overall I/O system in an embedded environment.

The purpose of the I/O subsystem is to hide the device-specific information from the kernel as well as from the application developer and to provide a uniform access method to the peripheral I/O devices of the system.

This section discusses some fundamental concepts from the Perspective of the device driver developer. Figure 12.1 illustrates the I/O subsystem in relation to the rest of the system in a layered software model. As Shown, each descending layer adds additional detailed information to the architecture needed to manage a given device. Figure 12.1: I/O subsystem and the layered model.

Figure 12.1: I/O subsystem and the layered model.

In *memory-mapped I/O*, the device address is part of the system memory address space. Any machine instruction that is encoded to transfer data between a memory location and the processor or between two memory locations can potentially be used to access the I/O device.

The I/O device is treated as if it were another memory location. Because the I/O address space occupies a range in the system memory address space, this region of the memory address space is not available for an application to use.

Figure 12.3: Memory-mapped I/O. The memory-mapped I/O space does not necessarily begin at offset 0 in the system address space, as illustrated in Figure