

Answers

- 1) Any system in which the time at which the output is produced in response to a set of inputs is of significance. Usually the input corresponds to some variable in the physical world and the output must have a relationship to this input. The lag from input time to output time must be sufficiently small for acceptable, and sometimes safe performance.
- 2) Concurrency is the ability of a system to execute several computations simultaneously, which may be potentially interacting with each other. The computations may be executing on multiple cores in the same chip, preemptively time-shared threads on the same processor, or executed on physically separated processors.
- 3) An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints.
- 4) An evolutionary prototype, as its name implies is a prototype that changes through out the project development in an incremental fashion. The advantages of this type of development are as follows:-

The hardware is available from a very early point in the project for the software process to begin.

Any problems that exist with the initial design will be discovered more readily.

Any deviation from the specifications will become apparent earlier, hence the system is more likely to meet the customer requirements.

Reduces development risk by spreading the implementation over a longer time frame

A disadvantage of evolutionary prototyping is knowing when it is necessary to stop tweaking the system and actually finish the development.

5) *Any 3 from below would be acceptable.*

a) Explicit information can cause problems due to the size of the generated document which means that things can be missed or misinterpreted

b) Ambivalence between personnel working on the project

c) A lack of control of the communications channels. All parties must fully understand the communications channel and stay within its confines.

d) A lack of formal history and revision control

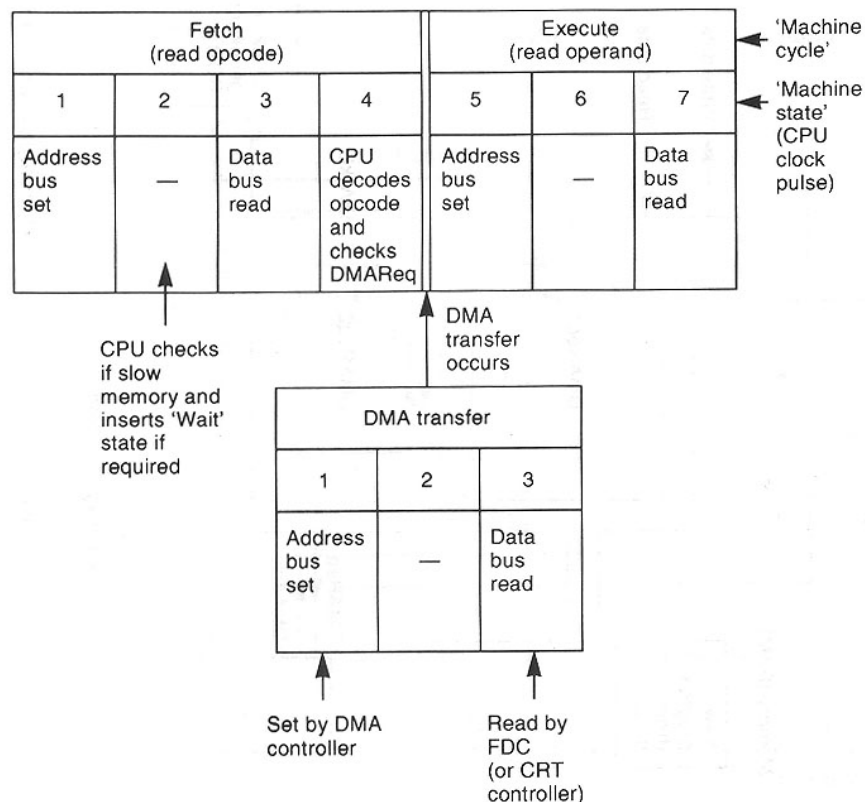
- 6) DMA (Direct memory access) is a feature of computers that allows certain hardware subsystems within the computer to gain access system memory independently of the central processing unit (CPU)

Burst mode (aka "Block Transfer Mode")

An entire block of data is transferred in one continuous sequence. Once the DMA controller is granted access to the system buses, transfer of all bytes of data in the data block is completed before releasing control of the system buses. This renders the CPU inactive for relatively long periods of time.

Cycle stealing mode

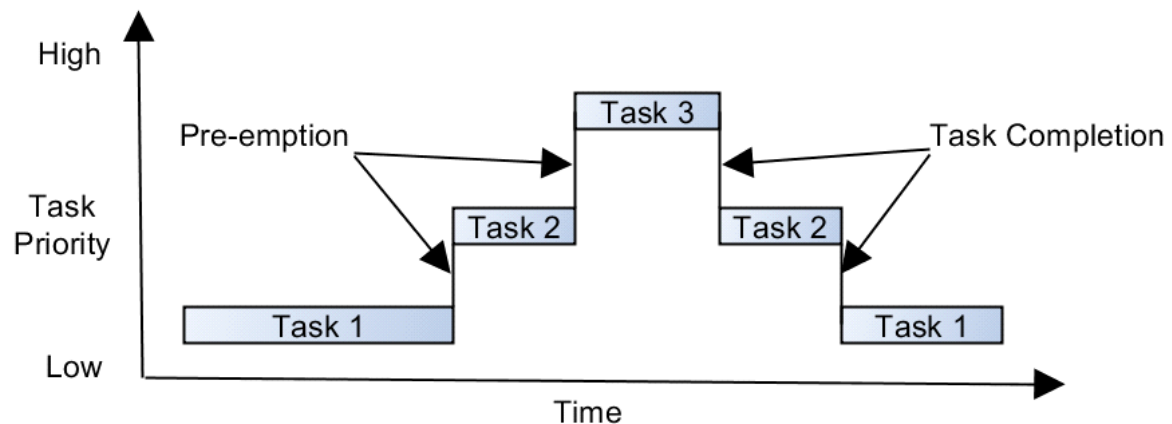
Cycle stealing is used in systems in which disabling the CPU for the length of time needed for burst transfer modes is not an option. In the cycle stealing mode, the DMA controller obtains access to the system buses using BR (Bus Request) and BG (Bus Grant) signals, which are the two signals controlling the interface between the CPU and the DMA controller. However, in cycle stealing mode, after one byte of data transfer, the control of the system bus is returned to the CPU via BG. Control is repeatedly requested again via BR. Only one byte of data is transferred at a time until the entire block has been transferred. By continually working in this mode the DMA controller interleaves instruction and data transfers. The CPU processes an instruction, then the DMA controller transfers one data value, and so on. The data block is not transferred as quickly in cycle stealing mode as in burst mode, but the CPU is not idle for as long. Cycle stealing mode is useful for systems that monitor data in real time.



7)

A scheduler :-

Maintains a ranked list of tasks based on priority.
Ensures that all tasks meet their timing constraints.



Pre-emptive scheduling

Pre-emptive scheduling allows a task with higher priority to take control of the system away from the currently running task. Upon completion of the higher priority task, system control is passed back to the task which was previously running. As can be seen from the diagram above higher priority tasks may interrupt lower priority tasks to ensure they run at the correct time.

8)

Hard Real-Time Systems	Soft Real-Time Systems
Meets deadlines with zero degree of flexibility	Meets deadlines with some degree of flexibility
Missed deadlines has catastrophic results	Missed deadlines does not cause catastrophic results
Cost of catastrophe is high	Costs rise in proportion to the delay
Examples	
Weapons defence systems	Computer simulation
Anti Lock braking systems	Internet audio

9) A task is :-

A group of instructions performing a function within a system.
An independant thread of operation
Schedulable.

The elements used to characterise a task are:-

An unique ID
A Priority level
A Stack and task routine
A Task Control Block, the contents of the TCB are system and function dependant but would normally contain:-

Process identification data - almost invariably an integer number. In a multiuser-multitasking system, the identifier of the parent process, user identifier, user group identifier.

Processor state data - is data that define the status of a process when it's suspended, allowing the system to restart it later and still execute correctly. This always includes the content of the CPU general-purpose registers, the CPU process status word, stack and frame pointers etc

Process control data. - The scheduling state, e.g. in terms of "ready", "suspended", etc., a priority value, the amount of time elapsed since the process had control of the system or since it was suspended.

Interprocess communication information: various flags, signals and messages.

Process privileges, in terms of allowed/unallowed access to system resources.

Accounting information, such as when the process was last run, how much system time it has accumulated, etc.

10) An exception is any event that disrupts the normal execution of the processor and forces the processor into execution of special instructions.

Synchronous exceptions	Asynchronous exceptions
Raised by internal events like processor instructions	Associated with hardware signals from external hardware devices. Also called as interrupts.
Examples	
An arithmetical operation that results in division by zero	Pushing the reset button on an embedded board.