QUESTION 1 [5.0 marks]: Select ONLY the best answer from the suggested multiple choices:

1.	**The processor can transit from kernel mode to user mode, if _____**		**2.**	**_____specifies the location of next instruction to execute.**
a.	the user executes a privileged instruction		a.	Instruction register
b.	I/O is completed		b.	Cache coherency
c.	the user executes a trap instruction		c.	Program counter
d.	None of the above		d.	None of the above
3.	**_____ is an operating system function that controls the order and time in which programs are run**		**4.**	**_____ is an operating system function that manages the placement of programs and data in memory.**
a	File Management		a	Task Management
b	Job Scheduling		b	Device Management
c	Task Management		c	Job Management
d	I/O Management		d	Memory Management
5.	**_____ implies that a computer is simultaneously running two or more programs (task) at the same time**		**6.**	**_____ is used to allows execution of processes not completely in memory**
a.	Client		a.	Bootstrap program
b.	Multitasking		b.	Main memory
c.	Cursor		c.	Virtual memory
d.	Mouse		d.	Dual mode
7.	**Bootstrap program is stored in _____.**		**8.**	**The _____ routine determines the nature of the interrupt and performs whatever actions are needed.**
a.	magnetic disks		a.	interrupt handler
b.	Read Only Memory (ROM)		b.	device controller
c.	Random Access memory (RAM)		c.	program handler
d.	tap drivers		d.	interrupt signal
9	**_____ is a program that assists the user in maintaining a computer's magnetic disks to ensure optimal performance**		**10**	**_____ is a program that accepts requests for action from the operating system and causes a device, such as a printer, to execute the requests**
a.	File Compression		a.	Utility
b.	Storage Management		b.	Driver
c.	File Management		c.	Taskbar
d.	Mass Storage Management		d.	Icon

Q 2) Which of the following instructions should be privileged?

a) Set value of timer
b) Read the clock
c) Clear memory
d) Switch from user to kernel mode

Set value of timer
Privileged. This instruction must be privileged, otherwise a process could reset the timer to its own advantage and dominate the CPU resources.

Read the clock
Non-privileged. This instruction should not be privileged. There is no security effects of a process reading the clock value.

Clear memory
Privileged. This would wipe out the code and data of the OS and any other processes. User level processes should not be allowed to do this. Should be privileged.

Switch from user to kernel mode
Privileged. This is a privileged instruction because switching to monitor mode would give the process operating system privileges.

Q 3)

a) What abstracts the hardware? Why? Give an example of such abstraction.

- OS and application programs abstract the hardware of a computer.
- This abstraction helps in controlling and coordinating the use of hardware among various application programs for various users.
    - OS Example: Windows, Linux
    - Applications: Compilers, Editors.

Q 4) What is the difference between: mono-programming and multi-programming.

- In a monoprogram machine a single job occupies the system from start until end. In such a case CPU sits idle when there is a need of user action.
- A multiprogram machine increases CPU utilization by organizing jobs so that CPU always has something to execute.

Q 5) What are the three main purposes of an operating system?

- To provide an environment for a computer user to execute programs on computer hardware in a convenient and efficient manner.
- Resource allocator. To allocate the resources of the computer as needed to solve the problem given. The allocation process should be as fair and efficient as possible.
- As a control program it serves two major functions: (1) supervision of the execution of user programs to prevent errors and improper use of the computer, and (2) management of the operation and control of I/O devices.

Q 6)

Definitions following terms:

a) Program
b) Process

Program: A sequence of instructions that a computer can interpret and execute.
Process: A process is a running instance of a program, including all variables and other state.

Q 7) What is DMA? How does it operate?

DMA stands for direct memory access. It is technique of handling data transfer between memory and peripheral (I/O) devices that bypasses the central processing unit. In this method the device controller transfers an entire block of data directly to or from its own buffer storage to memory. Only one interrupt is generated per block, to tell the device driver that the operation is completed, rather than the one interrupt per byte generated for low speed devices. While the device controller is performing these operations, the CPU is available to accomplish other work.

Q 8) What are the main differences between operating systems for mainframe computers and PCs?

The design goals of operating systems for those machines are quite different.

- PCs are inexpensive, so wasted resources like CPU cycles are inconsequential.
- Mainframes are the opposite, so resource use is maximized, at the expense of ease of use.

Q 9) Define the essential properties of the following types of operating systems:

a) Time sharing
b) Real time
c) Distributed
d) Clustered

a) **Time sharing**
   Uses CPU scheduling and multiprogramming to provide economical interactive use of a system. The CPU switches rapidly from one user to another. Instead of having a job defined by spooled card images, each program reads its next control card from the terminal, and output is normally printed immediately to the screen.
b) **Real time**
   Often used in a dedicated application. The system reads information from sensors and must respond within a fixed amount of time to ensure correct performance.
c) **Distributed**
   Distributes computation among several physical processors. The processors do not share memory or a clock. Instead, each processor has its own local

memory. They communicate with each other through various communication lines, such as a high-speed bus or telephone line.

d) Clustered

Like parallel systems, clustered systems gather together multiple CPUs to accomplish computational work. Clustered systems differ from parallel systems, however, in that they are composed of two or more individual systems coupled together.

Q 10) What is the main difficulty that a programmer must overcome in writing an operating system for a real-time environment?

The main difficulty is keeping the operating system within the fixed time constraints of a real-time system. If the system does not complete a task in a certain time, it could cause a breakdown of the entire system it is running. Therefore when writing an operating system for a real-time system, the writer must be sure that his scheduling schemes don't allow response time to exceed the time constraint.

Ch 2

Q 11) What is API?

Application program interface used to specify the parameter and specification of system call.

Q 12) What is the types of system call ?

Process control
File management
Device management
Information maintenance
Communications

Protection

Q 13) What are the three major activities of an operating system with regard to secondary storage management?

The three major activities are:

- Free-space management.
- Storage allocation.
- Disk scheduling

Q 14) What is the purpose of system programs?

System programs can be thought of as bundles of useful system calls. They provide basic functionality to users so that users do not need to write their own programs to solve common problems.

Q 15) What is the purpose of system calls?

System calls allow user-level processes to request services of the operating system.

Q 16) Describe in details two main activities of an operating system in regard to:

a. memory management.
b. process management.

Process Management:

- The creation and deletion of both user and system processes
- The suspension and resumption of processes
- The provision of mechanisms for process synchronization
- The provision of mechanisms for process communication
- The provision of mechanisms for deadlock handling

Memory Management:

- Keep track of which parts of memory are currently being used and by whom
- Decide which processes are to be loaded into memory when memory space becomes available
- Allocate and deallocate memory space as needed

Q 17) Explain how does the CPU know when the memory operations are complete.

When the device is finished with its operation, it interrupts the CPU to indicate the completion of the operation.

Q
A) What is the purpose of system programs?

System programs can be thought of as bundles of useful system calls. They provide basic functionality to users so that users do not need to write their own programs to solve common problems.

B) What is the purpose of system calls?

System calls allow user-level processes to request services of the operating system.

C) Explain how does the CPU know when the memory operations are complete.

When the device is finished with its operation, it interrupts the CPU to indicate the completion of the operation.