P2CA51ET
OPERATING SYSTEMS

Question Bank

PART A	
S. No.	**Question**
1	**What are the objectives of operating system?** **Ans:** An operating system is a program that manages the computer hardware. it act as an intermediate between a users of a computer and the computer hardware. It controls and coordinates the use of the hardware among the various application programs for the various users.
2	**What are the advantages of peer-to-peer systemsover client-server systems?** **Ans:** • The main advantage of peer to peer network is that it is easier to set up • In peer-to-peer networks all nodes are act as server as well as client therefore no need of dedicated server. • The peer to peer network is less expensive. • Peer to peer network is easier to set up and use this means that you can spend less time in the configuration and implementation of peer to peer network. • It is not require for the peer to peer network to use the dedicated server computer. Any computer on the network can function asboth a network server and a user workstation
3	**What is the purpose of system programs/systemcalls?** **Ans:** System programs can be thought of as bundlesof useful system calls. They provide basic functionality to users so that users do not need to

	write their own programs to solve commonproblems.
4	**How does an interrupt differ from a trap?(Nov/Dec 2016)(Apr/May 2018)** **<u>Ans:</u>** An interrupt is a hardware-generated signal that changes the flow within the system. A trap is a software-generated interrupt. An interrupt can be used to signal the completion of I/O so that the CPU doesn't have to spend cycles polling the device. A trap can be used to catch arithmetic errors or to call system routines
5	**What are disadvantages of multi-processorsystems?(Nov/Dec 2016)** **<u>Ans:</u>** • Complex Operating System is required • Large main memory required • Very expensive
6	**Defend timesharing differ from multiprogramming? If so, how?(April/May 2015)** <u>Ans:</u> Main difference between multiprogramming and time sharing is that multiprogramming is the effective utilization of CPU time, by allowing several programs to use the CPU at the same time but time sharing is the sharing of a computing facility by several users that want to use the same facility at the same time.
7	**Why API's need to be used rather than systemcall? (April/May2015)** **<u>Ans:</u>** There are four basic reasons: 1) System calls differ from platform to platform. Byusing a stable API, it is easier to migrate your software to different platforms. 2) The operating system may provide newer versions of a system call with enhanced features. The API implementation will typically also be upgraded to provide this support, so if you call the API, you'll get it. 3) The API usually provides more useful functionality than the system call directly. If you

make the system call directly, you'll typically have to replicate the pre-call and post-call code that'salready implemented by the API. (For example the 'fork' API includes tons of code beyond just making the 'fork' system call. So does 'select'.)

4) The API can support multiple versions of the operating system and detect which version it needs to use at run time. If you call the system directly, you either need to replicate this code or you can only support limited versions.

8 **Compare and contrast DMA and cache memory.(Nov/Dec 2015)**

Ans: **DMA(Direct Memory Access):** Direct memory access (DMA) is a feature of computer systems that allows certain hardware subsystems to access main memory (Random-access memory), independent of the central processing unit (CPU).

Cache Memory: A cache is a smaller, faster memory, closer to a processor core, which stores copies of the data from frequently used main memory locations.

So, both DMA and cache are used for increasing thespeed of memory access.

9 **Distinguish between batch systems and timesharing systems.(Nov/Dec 2015)**

Ans:

Batch System	**Time sharing system**
Jobs or work is keep in order and jobs are run one after the other	The tasks are givenspecific time and operating system switches between different tasks.
there won't be any user interactions	user interaction isinvolved in the processing

10 **Compare tightly coupled systems and looselycoupled systems?**

Ans:

	Loosely coupled systems:- Each processor has its own local memory. Each processor can communicate with other all through communication lines **Tightly coupled systems:-** Common memory is shared by many processors No need of any special communication lines.
11	**What is real time system?** **Ans:** A real time system has well defined, fixed time constraints. Processing must be done within the defined constraints, or the system will fail. It is often used as a control device in a dedicated application.
12	**What are privileged instructions?** **Ans:** Some of the machine instructions that may cause harm to a system are designated as privileged instructions. The hardware allows the privileged instructions to be executed only in monitor mode.
13	**What do you mean by system calls?** **Ans:** System calls provide the interface between a process and the operating system. When a system call is executed, it is treated as by the hardware as software interrupt.
14	**Define: process** **Ans:** A process is a program in execution. It is an active entity and it includes the process stack, containing temporary data and the data section contains global variables.
15	**What is process control block?** **Ans:** Each process is represented in the OS by a process control block. It contain many pieces ofinformation associated with a specific process.
16	**What is scheduler?** **Ans:** A process migrates between the various scheduling queues through out its life time. The OS must select processes from these queues in some fashion. This selection process is carried out by a scheduler.

17	**What are the use of job queues, ready queues and device queues?** **Ans:** As a process enters a system they are put in to a job queue. This queues consist of all jobs in the system. The processes that are residing in main memory and are ready and waiting to execute are kept on a list called ready queue. The list of processes waiting for particular I/O devices kept in the device queue.
18	**What is meant by context switch?** **Ans:** Switching the CPU to another process requires saving the state of the old process and loading the saved state for the new process. This task is known as context switch.
19	**Discuss the difference between symmetric andasymmetric multiprocessing** **Ans:** **Symmetric multiprocessing (SMP),** in which each processor runs an identical copy of the operating system and these copies, communicate with one another as needed. **Asymmetric multiprocessing**, in which each processor is assigned a specific task. The master processor controls the system; the other processor looks the master.
20	**What is the main advantage of multiprogramming?** **Ans:** Multiprogramming makes efficient use of the CPU by overlapping the demands for the CPU and its I/O devices from various users. It attempts to increase CPU utilization by always having something for the CPU to execute.
21	**Discuss the main advantages of layered approachto system design?** **Ans:** As in all cases of modular design, designing an operating system in a modular way has several advantages. The system is easier to debug and modify because changes affect only limited sections of the system rather than touching all sections of theoperating system. Information is kept only where it is needed and is accessible only within a defined and restricted area, so any bugs affecting that data must be limited to a specific module or layer.

22	**List the advantage of multiprocessor system?** **Ans:** • Increased throughput. • Economy of scale. • Increased reliability.
23	**Define inter process communication.** **Ans:** Inter process communication provides a mechanism to allow the co-operating process to communicate with each other and synchronies their actions without sharing the same address space. It isprovided a message passing system.
24	**Identify the difference between mainframe and desktop operating system.** **Ans:** The design goals of operating systems for those machines are quite different. PCs are inexpensive, so wasted resources like CPU cycles are inconsequential. Resources are wasted to improve usability and increase software user interface functionality. Mainframes are the opposite, so resource use is maximized, at the expensive of ease of use.
25	**What is bootstrap program?** **Ans:** A bootstrap is the program that initializes theoperating system (OS) during startup.
26	**Illustrate the different interrupt clauses.Ans:** • Hardware interrupts • Software interrupts
27	**Identify what virtual machine is and what are the advantages virtual machines.** **Ans:** Virtual Machine is a completely separate individual operating system installation on your usual operating system. It is implemented by software emulation and hardware virtualization. Advantages: • Multiple OS environments can existsimultaneously on the same machine, isolated from each other;

	• Virtual machine can offer an instruction set architecture that differs from real computer's; • Easy maintenance, application provisioning, availability and convenient recovery.
28	**Distinguish between hard real time systems and soft real time systems.** **Ans:** A Hard Real-Time System guarantees that critical tasks complete on time. A Soft Real Time System where a critical real-time task gets priority over other tasks and retains that priority until it completes.
29	**Summarize the functions of DMA.** **Ans:** Direct memory access (DMA) is a method thatallows an input/output (I/O) device to send or receive data directly to or from the main memory, bypassing the CPU to speed up memory operations. The process is managed by a chip known as a DMA controller (DMAC).
30	**Illustrate the use of fork and exec system calls.** **Ans:** fork() is the name of the system call that the parent process uses to "divide" itself ("fork") into two identical processes. After calling fork(), the Creatingd child process is an exact copy of the parent except for the return value. When the child process calls exec(), all data in the original program is lost, and it is replaced with a running copy of the new program. This is known as overlaying.
31	**Define: Clustered systems.** **Ans:** A computer cluster is a set of loosely or tightly connected computers that work together so that, in many respects, they can be viewed as a single system.
32	**Some computer systems do not provide a privileged mode of operation in hardware. Is it possible to construct a secure operating system for these computer systems? (Nov/Dec 2018)**

	Ans: An operating system for a machine of this typewould need to remain in control (or monitor mode) at all times. This couldbe accomplished by two methods: a. Software interpretation of all user programs (likesome BASIC, Java, and LISP systems, for example). The softwareinterpreter would provide, in software, what the hardware does not provide. b. Require meant that all programs be written inhigh-level languages so that all object code is compiler-produced. The compilerwould generate (either in-ine or by function calls) the protection checks thatthe hardware is missing.
33	**Can traps be generated intentionally by a user program? If so, for what purpose? (Nov/Dec 2018)** **Ans:** A trap is a software-generated interrupt. An interrupt can be used to signal the completion of an I/O to obviate the need for device polling. A trap can be used to call operating system routines or to catch arithmetic errors.
34	**What are the three main purposes of anoperating system?** **Ans:**The three main puropses are: • To provide an environment for a computer user to execute programs on computer hardware in a convenient and efficient manner. • To allocate the separate 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.
35	**What is the purpose of system calls?** **Ans:**System calls allow user-level processes torequest services of the operating system.
36	**What are the five major activities of an operatingsystem with regard to process management?** **Ans:**The five major activities are: a. The creation and deletion of both user and systemprocesses b. The suspension and resumption of processes c. The provision of mechanisms for processsynchronization d. The provision of mechanisms for processcommunication e. The provision of mechanisms for deadlockhandling
37	**What are the three major activities of anoperating system with regard to memory management?** **Ans:**The three major activities are: a. Keep track of which parts of memory arecurrently being used and by whom. b. Decide which processes are to be loaded intomemory when memory space becomes available. c. Allocate and deallocate memory space as needed.
38	**What are the three major activities of an operating system with regard to secondary-storage management?** **Ans:**The three major activities are:

	• Free-space management. • Storage allocation. • Disk scheduling
39	**What is an Operating system?** **Ans:**An operating system is a program that manages the computer hardware. It also provides a basis for application programs and act as an intermediary between a user of a computer and the computer hardware. It controls and coordinates the use of the hardware among the variousapplication programs for the various users.
40	**List the services provided by an OperatingSystem?** **Ans:**Program executionI/O Operation File-System manipulationCommunications Error detection
41	**What is the Kernel?** **Ans:**A more common definition is that the OS is theone program running at all times on the computer, usually called the kernel, with all else being application programs.
42	**What is meant by Mainframe Systems?** **Ans:**Mainframe systems are the first computers developed to tackle many commercial and scientific applications. These systems are developed from the batch systems and then multiprogramming system and finally time sharing systems.
43	**What is Multiprocessor System?** **Ans:**Multiprocessor systems have systems more than one processor for communication, sharing thecomputer bus, the memory, clock & peripheral

	devices.
44	**What are the advantages of multiprocessors**?**Ans:**Increased throughput Economy of scale Increased reliability
45	**What is the use of Fork and Exec System Calls?** **Ans:**Fork is a System calls by which a new process is created. Exec is also a System call, which is used after a fork by one of the two processes to replace the process memory space with a new program.
46	**What are the five major categories of SystemCalls?** **Ans:** Process Control File-management Device-management Information maintenance Communications
47	**What are the modes of operation in HardwareProtection?** **Ans:** User Mode Monitor Mode
48	**What is meant by Batch Systems?** **Ans:**Operators batched together jobs with similar needs and ran through the computer as a group .The operators would sort programs into batches with similar requirements and as system become available, it would run each batch.
49	**List the privileged instruction.**

	Ans: a. Set value of timer. b. Clear memory. c. Turn off interrupts. d. Modify entries in device-status tab e. Access I/O device.
50	**What are the Components of a ComputerSystem?** **Ans:** Application ProgramSystem Program Operating System Computer Hardware
	PART B & C
1	Explain different operating system structures with neat sketch. **(Nov/Dec 2015) (Apr/May 2017)** **(Apr/May 2018)** Refer page no 55 – 61 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
2	Explain the various types of system calls with examples. **(May/June 2015) (Nov/Dec 2015)** **(Apr/May 2017) (Nov/Dec 2018)** Refer page no 62 – 73 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
3	What are the basic functions of OS and DMA **(Nov/Dec 2015) (Apr/May2017)** Refer page no 464 – 466 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
4	Explain the concept of multiprocessor andMulticore organization. **(Apr/May 2017)** Refer page no 14 – 16 from text book “AbrahamSilberschatz, Peter Baer Galvin and Greg Gagne,

	“Operating System Concepts”, 9th Edition, JohnWiley and Sons Inc., 2012”.
5	What are the advantages and disadvantages of using the same system call interface for both files and devices. **(Nov/Dec 2016)** Refer page no 64 – 71 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
6	Describe the difference between symmetric and asymmetric multiprocessing. Discuss the advantages and disadvantages of multiprocessor systems. **(May/June 2016) (Nov/Dec 2016)** Refer page no 12 – 18 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
7	Discuss in detail about Distributed systems. **(May/June 2016)** Refer page no 37 – 38 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
8	Demonstrate the three methods for passing parameters to the OS with examples. **(May/June 2016)** Refer page no 120 – 128 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
9	Explain how protection is provided for the hardwareresources by the operating system. **(Nov/Dec 2016)** Refer page no 30 –31 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
10	List the various services provided by operatingsystems. **(Nov/Dec 2016)**

	(Apr/May 2018) Refer page no 53-56 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
11	Discuss the DMA driven data transfer technique. **(May/June 2015)** Refer page no 12, 583-585 from text book “Abraham Silberschatz, Peter Baer Galvin and GregGagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
12	Discuss about the evolution of virtual machines. Also explain how virtualization could be implemented in operating systems. **(May/June 2015)** Refer page no 40 – 41 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
13	With neat sketch, discuss about computer system overview. **(Nov/Dec 2015)** Refer page no 27 – 34 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
14	Give reasons why caches are useful. What problems do they solve and cause? If a catch can be made as large as the device for which it is catching why not make it that large and eliminate the device?**(Apr/May 2018)**
15	Discuss the functionality of system boot withrespect to an operating system. **(Nov/Dec 2018)**
16	Discuss the essential properties of the followingtypes of systems, **(Nov/Dec 2018)** i) Time sharing systems ii) Multi-processor systems iii) Distributed systems

PART – A	
S. No.	**Question**
1	**Compare and contrast Single-threaded and multi-threaded process. (Apr/May 2017)** **Ans:**Single-threading is the processing of one command/ process at a time. Whereas multi threading is a widespread programming and execution model that allows multiple threads to exist within the context of one process. These threads share the process's resources, but are able to execute independently.
2	**Priority inversion is a condition that occurs in real time systems – Analyzing on this statement. (Apr/May 2017)** **Ans:** Priority inversion is a problem that occurs in concurrent processes when low-priority threads hold shared resources required by some high-priority threads, causing the high priority-threads to block indefinitely. This problem is enlarged when the concurrent processes are in a real time system where high- priority threads must be served on time. Priority inversion occurs when task interdependency exists among tasks with different priorities.
3	**Distinguish between CPU bounded, I/O boundedprocesses. (Nov/Dec 2016)** **Ans:** CPU bound process, spends majority of itstime simply using the CPU (doing calculations). I/O bound process, spends majority of itstime in input/output related operations.

4	**What resources are required to Creatingthreads? (Nov/Dec 2016)** **Ans:** When a thread is Creatingd the threads does not require any new resources to execute. The thread shares the resources of the process to which it belongs to and it requires a small data structure to hold a register set, stack, and priority.
5	**Under what circumstances user level threads are better than the kernel level threads? (May/June 2016) (Nov/Dec 2015)** **Ans:** User-Level threads are managed entirely by the run-time system (user-level library).The kernel knows nothing about user-level threads and manages them as if they were single-threaded processes. User-Level threads are small and fast, each thread is represented by a PC, register, stack, and small threadcontrol block. Creating a new thread, switching between threads, and synchronizing threads are done via procedure call. i.e. no kernel involvement. User- Level threads are hundred times faster than Kernel- Level threads. User level threads are simple to represent, simple to manage and fast and efficient.
6	**What is the meaning of the term busy waiting? (May/June 2016)(Nov/Dec2018)** **Ans:** Busy-waiting, busy-looping or spinning is a technique in which a process repeatedly checks to see if a condition is true.
7	**List out the data fields associated with process control blocks. .(April/May 2015)** **Ans:** Process ID, pointers, process state, priority, program counter, CPU registers, I/O information,Memory management information, Accounting information, etc.
8	**Define the term 'Dispatch Latency". (April/May 2015)** **Ans:** The term dispatch latency describes the amount of time it takes for a system to respond to a request for a process to begin operation.
9	**What is the concept behind strong semaphoreand spinlock? (Nov/Dec 2015)**

Ans: Strong semaphores specify the order in which processes are removed from the queue (FIFO order),which guarantees avoiding starvation.

Spinlock is a lock which causes a thread trying to acquire it to simply wait in a loop ("spin") while repeatedly checking if the lock is available.

10 **What is a thread?**

Ans: A thread otherwise called a lightweight process (LWP) is a basic unit of CPU utilization, it comprises of a thread id, a program counter, a register set and a stack. It shares with other threads belonging to the same process its code section, data section, and operating system resources such as openfiles and signals.

11 **What are the benefits of multithreadedprogramming?**

Ans: The benefits of multithreaded programmingcan be broken down into four major categories:

- Responsiveness
- Resource sharing
- Economy
- Utilization of multiprocessor architectures

12 **Compare user threads and kernel threads.**

Ans:

User threads:-

User threads are supported above the kernel and are implemented by a thread library at the user level. Thread creation & scheduling are done in the user space, without kernel intervention. Therefore they are fast to Creating and manage blocking system call will cause the entire process to block

Kernel threads:-

Kernel threads are supported directly by the operating system .Thread creation, scheduling and management are done by the operating system. Therefore they are slower to Creating & manage compared to user threads. If the thread performs a blocking system call, the kernel can schedule another thread in the application for execution

13 **What is the use of fork and exec system calls?**

Ans: Fork is a system call by which a new process isCreatingd. Exec is also a system call, which is used after a fork by one of the two processes to place the process memory space with a new program.

14 **Distinguish between user-level threads and kernel-level threads? Under what circumstances is one type better than the other?**

Ans:

- User-level threads are unknown by the kernel, whereas the kernel is aware of kernel threads.
- User threads are scheduled by the thread library and the kernel schedules kernel threads.
- Kernel threads need not be associated with a process whereas every user thread belongs to
  a process.

15 **Define thread cancellation and target thread.**

Ans: The thread cancellation is the task of terminating a thread before it has completed. A thread that is to be cancelled is often referred to as the target thread. For example, if multiple threads are concurrently searching through a database and one thread returns the result, the remaining threads might be cancelled.

16 **What are the different ways in which a threadcan be cancelled?**

Ans: Cancellation of a target thread may occur intwo different scenarios:

Asynchronous cancellation: One threadimmediately terminates the target thread is called asynchronous cancellation.

Deferred cancellation: The target thread can periodically check if it should terminate, allowing the target thread an opportunity to terminate itself in an orderly fashion.

17 **Define CPU Scheduling.**

Ans: CPU scheduling is the process of switching the CPU among various processes. CPU scheduling is the basis of multiprogrammed operating systems. By switching the CPU among processes, the operating system can make the computer more productive.

18	**Distinguish between preemptive and non- preemptive Scheduling.** **Ans:** Under nonpreemptive 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.
19	**List the functions of Dispatcher Module.** **Ans:** The dispatcher is the module that gives control of the CPU to the process selected by the short- termscheduler. This function involves: • Switching context • Switching to user mode • Jumping to the proper location in the userprogram to restart that program.
20	**What are the various scheduling criteria for CPUscheduling?** **Ans:** The various scheduling criteria are, • CPU utilization • Throughput • Turnaround time • Waiting time • Response time
21	**What are the requirements that a solution to thecritical section problem must satisfy?** **Ans:** The three requirements are • Mutual exclusion • Progress • Bounded waiting
22	**Define: Critical section problem.** **Ans:** Consider a system consists of 'n' processes. Each process has segment of code called a critical section, in which the process may be changing common variables, updating a table, writing a file. When one process is executing in its critical section, no other process can allowed executing in its criticalsection.
23	**How will you calculate turn-around time?** **Ans:** Turnaround time is the interval from the timeof submission to the time of completion of a process.

It is the sum of the periods spent waiting to get into memory, waiting in the ready queue, executing on the CPU, and doing I/O.

24 **Name two hardware instructions and their definitions which can be used for implementing mutual exclusion.**

Ans:

- **TestAndSet**

```
boolean TestAndSet (boolean &target)

{

boolean rv = target;target = true;
return rv;

}
```

- **Swap**

```
void Swap (boolean &a, boolean &b)

{

boolean temp = a;a = b;
b = temp;

}
```

25 **What is a semaphore?**

Ans: A semaphore 'S' is a synchronization tool which is an integer value that, apart from initialization, is accessed only through two standard atomic operations; wait and signal .Semaphores can be used to deal with the n-process critical section problem. It can be also used to solve various Synchronization problems.

26 **Define Deadlock.**

Ans: A process requests resources; if the resources are not available at that time, the process enters a wait state. Waiting processes may never again change state, because the resources they have requested are held by other waiting processes. This situation is called a deadlock.

27 **List two programming examples of multithreading giving improved performance over a single-threaded solution.**

Ans:

- A Web server that services each request in a separate thread.
- A parallelized application such as matrix multiplication where different parts of the matrix may be worked on in parallel.
- An interactive GUI program such as a debugger where a thread is used to monitor user input, another thread represents the running application, and a third thread monitors performance.

28 **What are the conditions under which a deadlocksituation may arise?**

Ans: A deadlock situation can arise if the followingfour conditions hold simultaneously in a system:

- Mutual exclusion
- Hold and wait
- No pre-emption
- Circular wait

29 **What are the methods for handling deadlocks?**

Ans: The deadlock problem can be dealt with in one

	of the three ways: a. Use a protocol to prevent or avoid deadlocks, ensuring that the system will never enter a deadlock state. b. Allow the system to enter the deadlock state, detect it and then recover. c. Ignore the problem all together, and pretend that deadlocks never occur in the system.
30	**What is resource-allocation graph?** **Ans:** Deadlocks can be described more precisely in terms of a directed graph called a system resource allocation graph. This graph consists of a set of vertices V and a set of edges E. The set of vertices V is partitioned into two different types of nodes; P the set consisting of all active processes in the system and R the set consisting of all resource types in the system.
31	**Define busy waiting and Spinlock.** **Ans:** When a process is in its critical section, any other process that tries to enter its critical section must loop continuously in the entry code. This is called as busy waiting and this type of semaphore is also called a spinlock, because the process keeps on waiting for the lock.
32	**What are the benefits of synchronous and asynchronous communication? (Apr/May 2018)** **Ans:**A benefit of synchronous communication is that it allows a rendezvous between the sender and receiver. An asynchronous operation is non-blocking and onlyinitiates the operation.
33	**Can a multithreaded solution using multiple user-level threads achieve better performance on a multiprocessor system than on a single- processor system?(Nov/Dec 2018)** **Ans:** A multithreaded system comprising of multipleuser-level threads cannot make use of the different processors in a multiprocessor system simultaneously.
34	**Define process?**

	Ans: A process is more than a program code, which is sometime known as the text section. It also includes the current activity, as represented by the value of the program counter and the processor's registers.
35	**Describe the actions taken by a kernel to context-switch between kernel level threads.** **Ans:** Context switching between kernel threads typically requires saving the value of the CPU registers from the thread being switched out andrestoring the CPU registers of the new thread being scheduled
36	**What is meant by the state of the process?** **Ans:** The state of the process is defined in part by the current activity of that process. Each process may be in one of the following states. New: The process is being created. Running: Instruction are being executed Waiting: The process is waiting for some event tooccur. Ready: The process is waiting to be assigned to aprocessor Terminated: The process has finished execution
37	**Define process control block contain?** **Ans:** Each process is represented in the operating system by a process control block (PCB) – also called as task control block. The PCB simply serves as the repository for any information that may vary from process to process.
38	**What are the 3 different types of schedulingqueues?** **Ans:** Job Queue: As process enters the system theyare put into job queue. Ready Queue: The processes that are residing in themain memory and are ready and waiting to execute

	are kept in the queue. Device Queue: The list of processes waiting forparticular I/O device is called a device queue.
39	**Define schedulers?** **Ans:** A process migrates between the various scheduling throughout its lifetime. The operating system must select, for scheduling purposes, processes from these queues in some fashion. The selection process is carried out by the appropriate scheduler.
40	**What are the types of scheduler?** **Ans:** Long term scheduler or job scheduler selects processes from the pool and load them into the memory for execution. Short term scheduler or CPU scheduler, select among the processes that are ready to execute and allocates the CPU to one of them.
41	**Define critical section?** **Ans:** If a system consist on n processes {P0, P1,……., Pn-1}.Each process has a segment of codecalled a critical section, in which the process may bechanging common variables, updating a table , writing a file. The important feature of this system is that, when one process is in its critical section, no other process is to be allowed to execute in its critical section.
42	**Define Starvation in deadlock?** **Ans:** A problem related to deadlock is indefinite blocking or starvation, a situation where processes wait indefinitely within a semaphore. Indefinite blocking may occur if we add and remove processes from the list associated with a semaphore in LIFO order.
43	**Name some classic problem of synchronization?** **Ans:** The Bounded – Buffer Problem The Reader – Writer Problem

	The Dining –Philosophers Problem
44	**What is the sequence of operation by which a process utilizes a resource?** **Ans:** Under the normal mode of operation, a process may utilize a resource in only the followingsequence: Request: If the request cannot be granted immediately, then the requesting process must wait until it can acquire the response. Use: The process can operate on the resource.Release: The process releases the resource
45	**Give the condition necessary for a deadlocksituation to arise?** **Ans:** A deadlock situation can arise if the following4 condition hold simultaneously in a system. Mutual ExclusionHold and Wait No preemption Circular Wait
46	**Define 'Safe State"?** **Ans:** A state is safe if the system allocates resources to each process in some order and still avoid deadlock.
47	**Define race condition.** **Ans:** When several process access and manipulate same data concurrently, then the outcome of the execution depends on particular order in which the access takes place is called race condition. To avoid race condition, only one process at a time can manipulate the shared variable.
48	**Define entry section and exit section.** **Ans:** The critical section problem is to design aprotocol that the processes can use to cooperate.

Each process must request permission to enter its critical section. The section of the code implementing this request is the entry section. The critical section is followed by an exit section. The remaining code is the remainder section.

49 **Define busy waiting and spinlock.**

Ans: When a process is in its critical section, any other process that tries to enter its critical section must loop continuously in the entry code. This is called as busy waiting and this type of semaphore is also called a spinlock, because the process while waiting for the lock.

50 **Explain the difference between preemptive and nonpreemptive scheduling.**

Ans: Preemptive scheduling allows a process to be interrupted in the midst of its execution, taking the CPU away and allocating it to another process.

Non preemptive scheduling ensures that a process relinquishes control of the CPU only when it finishes with its current CPU burst.

PART B&C

1 Suppose that the following processes arrive for execution at the times indicated. Each process will run the listed amount of time. In answering the questions, use non-preemptive scheduling and base all decisions on the information you have at the time the decision must be made. **(Nov/Dec 2018)**

Process	Arrival Time	Burst Time
P1	0.0	8
P2	0.4	4
P3	1.0	1

a. **Find** the average turnaround time for these processes with the FCFS scheduling algorithm?

b. **Find** the average turnaround time for these

	processes with the SJF scheduling algorithm? c. The SJF algorithm is supposed to improve performance, but notice that we chose to run process P1 at time 0 because we did not know thattwo shorter processes would arrive soon. **Find**what is the average turnaround time will be if the CPU is left idle for the first 1 unit and then SJF scheduling is used. Remembering that processes P1 and P2 arewaiting during this idle time, so their waiting timemay increase. This algorithm could be known as future-knowledgescheduling. **(Apr/May2017)** **(Apr/May2018)** --Refer class work
2	State critical section problem? Discuss three solutions to solve the critical section problem. **(Apr/May 2017)** Refer page no 256-259 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
3	Illustrate an example situation in which ordinary pipes are more suitable than named pipes and an example situation in which named pipes are more suitable than ordinary pipes. **(Nov/Dec 2016)** Refer page no 140 – 145 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
4	Explain: why interrupts are not appropriate forimplementing synchronization primitives in multiprocessor systems. **(Nov/Dec 2016)(Nov/Dec 2018)** Refer page no 269-272 from text book “AbrahamSilberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
5	Elaborate the actions taken by the kernel to context-switch between processes. **(Nov/Dec 2016)**

Refer page no 112 -113 from text book “AbrahamSilberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.

6 Consider the following resource-allocation policy.Requests and releases for resources are allowed atany time. If a request for resources cannot besatisfied because the resources are not available, then we check any processes that are blocked,waiting for resources. If they have the desiredresources, then these resources are taken awayfrom them and are given to the requesting process.The vector of resources for which the waiting process is waiting is increased to include the resources that were taken away.

For example, consider a system with three resource types and the vector

Available initialized to (4,2,2). If process P0 asks for (2,2,1), it gets them. If P1 asks for (1,0,1), it gets them. Then, if P0 asks for (0,0,1), it is blocked (resource not available). If P2 now asks for (2,0,0), it gets the available one (1,0,0) and one that was allocated to P0 (since P0 is blocked).

P0‘s Allocation vector goes down to (1,2,1), and its Need vector goes up to (1,0,1).

a. Predict whether deadlock occurs? If so, give an example. If not, which necessary condition cannotoccur?

b. Predict whether indefinite blocking occurs?
(Nov/Dec 2015)

Refer page no 326-333 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.

-- Also Refer Class Work

7	Explain dining philosopher's problem**. (Apr/May2017) (Nov/Dec 2018)** Refer page no 272 – 273 from text book "Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012".
8	Distinguish among short-term, medium-term andlong-term scheduling with suitable example. **(Apr /May 2018)**
9	Explain the differences in the degree to which the following scheduling algorithms deiscriminate in favour of short processes: RR, Multilevel Feedback Queues **(Apr/May 2018)**
10	Discuss how the following pairs of schedulingcriteria conflict in certain settings. i) CPU utilization and response time ii) Average turn around time and maximum waiting time iii)I/O device utilization and CPU utilization. **(Nov/Dec 2018)**
11	Write about the various CPU schedulingalgorithms.
12	Write about critical regions and monitors.
13	Consider the following page reference string 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1 How many page faults would occur for the following replacement algorithms, assuming three frames that all frames are initially empty?
14	How can deadlock be detected? Explain.
15	Write notes about multiple-processor schedulingand real-time scheduling.

S.No.	PART A
1	**What is the difference between user-level instructions and privileged instructions? (April/May 2017)** **Ans:** A non-privileged (i.e. user-level) instruction is an instruction that any application or user can execute. A privilegedinstruction, on the other hand, is an instruction that can only be executed in kernel mode. Instructions are divided in this mannerbecause privileged instructions could harm the kernel.
2	**Define: Belady's anomaly? (April/May 2017)** **Ans:** In computer storage, Bélády's anomaly is the phenomenon in which increasing the number of page frames results in an increase in the number of page faults for certain memory access patterns. This phenomenon is commonlyexperienced when using the first-in first-out (FIFO) page replacement algorithm.
3	**What is the purpose of paging the page table? (Nov/Dec 2016)** **Ans:** In certain situations the page tables could become large enough that by paging the page tables, one could simplify the memory allocation problem (by ensuring that everything is allocated as fixed-size pages as opposed to variable-sized chunks) and also enable the swapping of portions of page table that are not currently used.
4	**Why page sizes are always power of 2? (Nov/Dec 2016)** **Ans:** Recall that paging is implemented by breaking up an address into a page and offset number. It is most efficient to break the address into X page bits and Y offset bits, rather than perform arithmetic on the address to calculate the page number and offset. Because each bit position represents a power of 2, splitting an address between bits results in a page size that is a power of 2.
5	**List two differences between logical and physical addresses.(May/June 2016)** **Ans:**

Logical	Physical

1. An address generated by CPU is referred to us a logical address.	1. An address seen by memory unit that is, the one loaded into the memory address register of the memory is referred to as physical address.
2. The set of all logical address generated by a program is a logical address space.	2. The set of all physical address corresponding to these logical addresses is a physical address.
3. For user view.	3. For system view.
4. The user program deals with logical address or these are generated by user (program).	4. These are generated by memory management unit (MMU).

6 **Define demand paging in memory management. (Nov/Dec 2015)**

Ans: In virtual memory systems, demand paging is a type of swapping in which pages of data are not copied from disk to RAM until they are needed.

7 **What are the steps required to handle a page fault indemand paging? (Nov/Dec 2015)**

Ans: Steps in handling page fault:

1. Operating system looks at another table todecide:
   - Invalid reference - abort
   - Just not in memory
2. Find free frame
3. Swap page into frame via scheduled diskoperation
4. Reset tables to indicate page now in memory Setvalidation bit = v
5. Restart the instruction that caused the page fault

8 **Tell the significance of LDT and GDT in segmentation.**

	(May/June 2015) **Ans:** The LDT is supposed to contain memory segments which are private to a specific program, while the GDT is supposed to contain global segments. In order to reference a segment, a program must use its index inside the GDT or the LDT. Such an index is called a segment selector or selector in short.
9	**What do you meant by thrashing? (May/June 2015) (May/June 2016)** **Ans:** A process that is spending more time in paging than executing is said to be thrashing. In other words it means that the process doesn't have enough frames to hold all the pages for its execution, it will do swapping pages in and out very frequently to keep executing.
10	**Explain dynamic loading.** **Ans:** To obtain better memory-space utilization dynamic loading is used. With dynamic loading, a routine is not loaded until it is called. All routines are kept on disk in a relocatable load format. The main program is loaded into memory and executed. If the routine needs another routine, the calling routine checks whether the routine has been loaded. If not, the relocatable linking loader is called to load the desired program into memory.
11	**Explain dynamic Linking.** **Ans:** Dynamic linking is similar to dynamic loading, rather that loading being postponed until execution time, linking is postponed. This feature is usually used with system libraries, such as language subroutine libraries. A stub is included in the image for each library-routine reference. The stub is a small piece of code that indicates how to locate the appropriate memory-resident library routine, or how to load the library if theroutine is not already present.
12	**Define Overlays.** **Ans:** To enable a process to be larger than the amount of memory allocated to it, overlays are used. The idea of overlays is to keep in memory only those instructions and data that are needed at a given time. When other instructions are needed, they are loaded into space occupied previously by instructions that are no longer needed.

13	**Define swapping.** Ans: A process needs to be in memory to be executed. However a process can be swapped temporarily out of memory to a backing store and then brought back into memory for continued execution. This process is called swapping.
14	**What is Demand Paging?** **Ans:** Virtual memory is commonly implemented by demand paging. In demand paging, the pager brings only those necessary pages into memory instead of swapping in a whole process. Thus it avoids reading into memory pages that will not be used anyway, decreasing the swap time and the amount of physical memory needed.
15	**What is pure demand paging?** **Ans:** When starting execution of a process with no pages in memory, the operating system sets the instruction pointer to the first instruction of the process, which is on a non-memory resident page, the process immediately faults for the page. After this page is brought into memory, the process continues to execute, faulting as necessary until every page that it needs is in memory. At that point, it can execute with no more faults. This schema is pure demand paging.
16	**Outline about virtual memory.** **Ans:** Virtual memory is a technique that allows the execution of processes that may not be completely in memory. It is the separation of user logical memory from physical memory. This separation provides an extremely large virtual memory, when only a smaller physical memory is available.
17	**Define lazy swapper.** **Ans:** Rather than swapping the entire process into main memory, a lazy swapper is used. A lazy swapper never swaps a page into memory unless that page will be needed.
18	**What are the common strategies to select a free hole from aset of available holes?** **Ans:** The most common strategies are, • First fit • Worst fit • Best fit
19	**Define effective access time.**

	Ans: Let p be the probability of a page fault . The value of p is expected to be close to 0; that is, there will be only a few page faults. The effective access time is Effective access time = (1-p) * ma + p * page fault time. Where ma : memory-access time.
20	**What is the basic approach for page replacement?** **Ans:** If no frame is free is available, find one that is not currently being used and free it. A frame can be freed by writing its contents to swap space, and changing the page table to indicate that the page is no longer in memory. Now the freed frame can be used to hold the page for which the process faulted.
21	**Distinguish between page and segment.** **Ans:** Paging is used to get a large linear address space without having to buy more physical memory. Segmentation allows programs and data to be broken up into logically independent address spaces and to aid sharing and protection.
22	**How the problem of external fragmentation can be solved.Ans:** Solution to external fragmentation : 1) Compaction : shuffling the fragmented memory into onecontiguous location. 2) Virtual memory addressing by using paging and segmentation.
23	**Formulate how long a paged memory reference takes if memory reference takes 200 nanoseconds .Assume a paging system with page table stored in memory.** **Ans:** 400 nanoseconds. 200 ns to access the page table plus 200 ns to access the word in memory.
24	**Evaluating the maximum number of pages needed If asystem supports 16 bit address line and 1K page size.** **Ans:** A 16 bit address can address 2^16 bytes in a byte addressablemachine. Since the size of a page 1K bytes (2^10), the number of addressable pages is 2^16 / >2^10 = 2^6 = 64pages.
25	**How does the system discover thrashing? (Nov/Dec 2018)** **Ans:** In a virtual memory system, thrashing is a situation when there is excessive swapping of pages between memory and the hard disk, causing the application to respond more slowly. The operating system often warns users of low virtual memory whenthrashing is occurring.

26	**What you mean by compaction? In which situation is itapplied.** **Ans:** Compaction is a process in which the free space is collected in a large memory chunk to make some space available for processes. In memory management, swapping Creatings multiple fragments in the memory because of the processes moving in and out. Compaction refers to combining all the empty spaces together and processes.
27	**Outline about TLB.** **Ans:** A translation lookaside buffer (TLB) is a memory cache that is used to reduce the time taken to access a user memory location. It is a part of the chip's memory-management unit (MMU). The TLB stores the recent translations of virtual memory to physical memory and can be called an address-translation cache.
28	**List the need of inverted page table.Ans:** • There will be only one page table in memory i.e Oneentry for each real page of memory. • Decreases the memory needed to store each page table.
29	**Define Address binding.** **Ans:** Address binding is the process of mapping the program's logical or virtual addresses to corresponding physical or main memory addresses. In other words, a given logical address is mapped by the MMU (Memory Management Unit) to a physicaladdress.
30	**List the steps needed to handle page fault.Ans:** 1. The memory address requested is first checked, tomake sure it was a valid memory request. 2. If the reference was invalid, the process is terminated.Otherwise, the page must be paged in. 3. A free frame is located, possibly from a free-frame list. 4. A disk operation is scheduled to bring in the necessarypage from disk. (This will usually block the process on an I/O wait, allowing some other process to use the CPU in the meantime.) 5. When the I/O operation is complete, the process’s pagetable is updated with the new frame number, and the invalid bit is changed to indicate that this is now a valid page reference.

	6. The instruction that caused the page fault must now berestarted from the beginning, (as soon as this process gets another turn on the CPU.)
31	**Define External Fragmentation. (Apr/May 2018)** **Ans:** It is a situation, when total memory available is enough toprocess a request but not in contiguous manner.
32	**What are the counting based page replacement algorithm? (Apr/May 2018)** **Ans:** These algorithms keep a counter of the number of references that have been made to each page. Example: Least Frequently Used(LFU), Most Frequently Used(MFU)
33	**Under what circumstances would a user be better off using atime-sharing system, rather than a PC or single-user workstation.(Nov/Dec 2018)** **Ans:** A user is better off under three situations: when it is cheaper, faster, or easier. For example: 1. When the user is paying for management costs, and the costs are cheaper for a time-sharing system than for a single-user computer. 2. When running a simulation or calculationg that takes too long to run on a single PC or workstation. 3. When a user is travelling and doesn't have laptop to carry around, they can connect remotely to a time-shared system and do their work.
34	**How is memory protected in a paged environment?Ans:** Protection bits that are associated with each frame accomplish memory protection in a paged environment. The protection bits can be checked to verify that no writes are being made to a read-only page.
35	**What are the major problems to implement Demand**

	Paging? **Ans:** The two major problems to implement demand paging is developing, Frame allocation algorithm Page replacement algorithm
36	**What is Internal Fragmentation?Ans:** When the allocated memory may be slightly larger than the requested memory, the difference between these two numbers isinternal fragmentation.
37	**What do you mean by Compaction?Ans:** Compaction is a solution to external fragmentation. The memory contents are shuffled to place all free memory together in one large block. It is possible only i f relocation is dynamic, and is done at execution time.
38	**What are Pages and Frames?Ans:** Paging is a memory management scheme that permits the physical -address space of a process to be non-contiguous. In the case of paging, physical memory is broken into fixed-sized blocks called frames and logical memory is broken into blocks of the same size called pages.
39	**What is the use of Valid-Invalid Bits in Paging?Ans:** When the bit is set to valid, this value indicates that the associated page is in the process's logical address space, and is thus a legal page. If the bit is said to invalid, this value indicates that the page is not in the process's logical address space. Using the valid-invalid bit traps illegal addresses.
40	**What is the basic method of Segmentation?**

Ans:

Segmentation is a memory management scheme that supports the user view of memory. A logical address space is a collection of segments. The logical address consists of segment number and offset. If the offset is legal, it is added to the segment base to produce the address in physical memory of the desired byte.

41 **Program containing relocatable code was created, assuming it would be loaded at address 0. In its code, the program refers to the following addresses: 50,78,150,152,154. If the program is loaded into memory starting at location 250, how do those addresses have to be adjusted?**

Ans:

All addresses need to be adjusted upward by 250.So the adjusted addresses would be 300, 328, 400, 402, and 40

42 **What is a Pure Demand Paging?Ans:**

When starting execution of a process with no pages in memory,

the operating system sets the instruction pointer to the firstinstruction of the process, which is on a non-memory resident page, the process immediately faults for the page. After this page is brought into memory, the process continues to execute, faulting as necessary until every page that it needs is in memory. At that point, it can execute with no more faults. This schema is pure demand paging.

43 **What is a Reference String?Ans:**

An algorithm is evaluated by running it on a particular string of

memory references and computing the number of page faults.The string of memory reference is called a reference string

44 **Define Secondary Memory.Ans:**

This memory holds those pages that are not present in main

memory. The secondary memory is usually a high speed disk. It is known as the swap device, and the section of the disk used forthis purpose is known as swap space.

45	**What is the basic approach of Page Replacement?Ans:** If no frame is free is available, find one that is not currently being used and free it. A frame can be freed by writing its contents to swap space, and changing the page table to indicate that the page is no longer in memory. Now the freed frame can be used to hold the page for which the process faulted.
46	**What is the various Page Replacement Algorithms used forPage Replacement?** **Ans:** FIFO page replacement Optimal page replacementLRU page replacement LRU approximation page replacementCounting based page replacement Page buffering algorithm
47	**What do you mean by Best Fit?Ans:** Best fit allocates the smallest hole that is big enough. The entire list has to be searched, unless it is sorted by size. This strategyproduces the smallest leftover hole.
48	**What do you mean by First Fit?Ans:** First fit allocates the first hole that is big enough. Searching can either start at the beginning of the set of holes or where the previous first-fit search ended. Searching can be stopped as soonas a free hole that is big enough is found.
49	**Name two differences between logical and physicaladdresses.** **Ans:** A logical address does not refer to an actual existing address;rather, it refers to an abstract address in an abstract address

	space. Contrast this with a physical address that refers to an actual physical address in memory. A logical address is generated by the CPU and is translated into a physical address by the memory management unit(MMU). Therefore, physical addresses are generated by the MMU.
50	**Consider a logical address space of 64 pages of 1024 wordseach, mapped onto a physical memory of 32 frames.** **a. How many bits are there in the logical address?** **b. How many bits are there in the physical address?Ans:** a. Logical address: 16 bits b. Physical address: 15 bits
PART B&C	
1	Explain about given memory management techniques. (i) Partitioned allocation (ii) Paging and translation look-aside buffer. **(Nov/Dec 2015) (Apr/May 2017)** Refer page no 360-371 from text book "Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012".
2	Elaborate about the free space management on I/O buffering and blocking. **(Apr/May 2017)** Refer page no 561 – 564 from text book "Abraham Silberschatz,Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012".
3	What is copy-on write feature and under what circumstances it is beneficial? What hardware support is needed to implement this feature? **(Nov/Dec 2016)** Refer page no 400-401 from text book "Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012".
4	When page faults will occur? Describe the actions taken by operating system during page fault. **(May/June 2016)** Refer page no 360-371 from text book "Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012".
5	Consider the following page reference string: 1, 2, 3, 4, 2, 1, 5,

	6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. Identify the no.of page faults would occur for the following replacement algorithms, assuming one, two, three, four, five, six, or seven frames? Remember all frames are initially empty, so your first unique pages will all cost one fault each. a.LRU replacement b. FIFO replacement c.Optimal replacement **(Apr/May 2015) (Nov/Dec2015)** --Refer class work
6	Explain about the difference between internal fragmentation and external fragmentation. **(Nov/Dec2016)** Refer page no 354-358 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
7	Why are segmentation and paging sometimes combined into onescheme? **(May/June 2016)** Refer page no 358-360 from text book “Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012”.
8	Explain why sharing a reentrant module is easier when segmentation is used than when pure paging is used with example. **(Apr/May 2018)**
9	Discuss situation under which the most frequently used page replacement algorithm generates fewer page faults than the least frequently used page replacement algorithm. Also dicuss under which circumstances the opposite holds. **(Apr/May 2018)**
10	Compare paging with segmentation in terms of the amount of memory required by the address translation structures in order to convert virtual addresses to physical addresses. **(Nov/Dec 2018)**
11	Most systems allow programs to allocate more memory to its address space during execution. Data allocated in the heap segments of programs is an example of such allocated memory. What is required to support dynamic memory allocation in the following schemes? **(Nov/Dec 2018)** i) Contiguous memory allocation ii)Pure segmentation iii) Purepaging
12	Differentiate local and global page replacement algorithm.

13	Explain the basic concepts of segmentation.
14	What is thrashing and explain the methods to avoid thrash
15	What is the maximum file size supported by a file system with 16 direct blocks, single, double, and triple indirection? Theblock size is 512 bytes. Disk block number can be stored in 4 by

UNIT IV	
PART A	
S. No .	Question
1	**Distinguish file from dictionary. (Apr/May2017)Ans:** A file is any kind of computer document whereas a directory is acollection of files and folders.
2	**Why it is important to scale up system bus and device speed as CPU speed increases? (Nov/Dec 2016)** **Ans:** Consider a system which performs 50% I/O and 50% computes. Doubling the CPU performance on this system would increase total system performance by only 50%. Doubling both system aspects would increase performance by 100%. Generally, it is important to remove the current system bottleneck, and to increase overall system performance, rather than blindly increasing the performance of individual system components.
3	**Define C-SCAN scheduling. (Nov/Dec 2016)Ans:** The elevator algorithm (also SCAN) is a disk scheduling algorithm to determine the motion of the disk's arm and head in servicing read and write requests.

This algorithm is named after the behaviour of a building elevator, where the elevator continues to travel in its current direction (up or down) until empty, stopping only to let individuals off or to pick up new individuals heading in the samedirection.

4 **How does DMA increase system concurrency? (May/June 2016)**

Ans:

DMA increases system concurrency by allowing the CPU to perform tasks while the DMA system transfers data via the system and memory buses.

5 **Why rotational latency is not considered in disk scheduling? (May/June2016)**

Ans:

Most disks do not export their rotational position information to the host. Even if they did, the time for this information to reach the scheduler would be subject to imprecision and the time consumed by the scheduler is variable, so the rotational position information would become incorrect. Further, the disk requests are usually given in terms of logical block numbers, and the mapping between logical blocks and physical locations is very complex.

6 **List the various file attributes. (Apr/May 2015) (Nov/Dec2018)**

Ans:

A file has certain other attributes, which vary from one operating system to another, but typically consist of these: Name, identifier, type, location, size, protection, time, and date and useridentification

7 **What is HSM? Where it is used? (Apr/May 2015)Ans:**

Hierarchical storage management (HSM) is a data storage technique, which automatically moves data between high-cost and low-cost storage media. HSM systems exist because high-speed storage devices, such as solid state drive arrays, are more expensive (per byte stored) than slower devices, such as hard disk drives, optical discs and magnetic tape drives.

8 **What are the functions of Virtual File System (VFS) layer infile system implementation? (Nov/Dec 2015)**

	Ans: A virtual file system (VFS) or virtual file system switch is an abstraction layer on top of a more concrete file system. The purpose of a VFS is to allow client applications to access different types of concrete file systems in a uniform way. A VFS can, for example, be used to access local and network storage devices transparently without the client application noticing the difference.
9	**What is a file?Ans:** A file is a named collection of related information that is recorded on secondary storage. A file contains either programs or data. A file has certain "structure" based on its type.
10	**What are the various file operations? (Nov/Dec2018)Ans:** The six basic file operations areCreating a file Writing a fileReading a file Repositioning within a fileDeleting a file Truncating a file
11	**What are the informations associated with an open file?Ans:** Several pieces of information are associated with an open filewhich may be: File pointer File open count Disk location of the file Access rights
12	**What are the different accessing methods of a file?** **Ans:**

	The different types of accessing a file are: **Sequential access:** Information in the file is accessedsequentially **Direct access:** Information in the file can be accessed withoutany particular order. **Other access methods:** Creating index for the file, indexedsequential access method (ISAM) etc.
13	**Define Directory.Ans:** The device directory or simply known as directory records information-such as name, location, size, and type for all files onthat particular partition. The directory can be viewed as a symboltable that translates file names into their directory entries.
14	**List** the operations that can be performed on a directory.
15	**Determine the most common schemes for defining the logicalstructure of a directory?** **Ans:** The most common schemes for defining the logical structure ofa directory Single-Level DirectoryTwo-level Directory Tree-Structured DirectoriesAcyclic-Graph Directories General Graph Directory
16	**Define UFD and MFD.Ans:** In the two-level directory structure, each user has her own user file directory (UFD). Each UFD has a similar structure, but lists only the files of a single user. When a job starts the system's master file directory (MFD) is searched. The MFD is indexed bythe user name or account number, and each entry points to the UFD for that user.
17	**Examine how an index file is used to speed up the access indirect-access files?**

	Ans: Have an index in memory; the index gives the key and the disk location of its corresponding record. Scan the index to find the record you want, and then access it directly.
18	**Explain what ISAM is.Ans:** ISAM is Indexed sequential access method in which the file is stored in sorted order. ISAM has a master index file, indicating in what part of another index file the key you want is; the secondary index points to the file records. In both cases, a binary search is used to locate a record.
19	**List disadvantages of using a single directory.Ans:** Users have no privacy. Users must be careful in choosing file names, to avoid names used by others. Users may destroy each other’s work.
20	**List** the advantages of two-level directory? **Ans:** Users are isolated from each other. Users have more freedom inchoosing file names.
21	**List the disadvantages of two-level directory?Ans:** Without other provisions, two users who want to cooperate witheach other are hampered in reaching each other‘s files, and system files are inaccessible.
22	**Discover the ways to overcome the disadvantages of two-level directory?** **Ans:** Provide links from one user directory to another, creating pathnames; system files become available by letting the command interpreter search your directory first, and then the systemdirectory if file needed is not in first directory.
23	**What are the allocation methods of a disk space?Ans:** Methods of allocating disk space which are widely in use are a. Contiguous allocation b. Linked allocation

	c. Indexed allocation
24	**List various layers of a file system.Ans:** The file system is composed of many different levels. Each levelin the design uses the feature of the lower levels to Creating newfeatures for use by higher levels. Application programsLogical file system File-organization moduleBasic file system I/O control Devices
25	**Define seek time and latency time.Ans:** The time taken by the head to move to the appropriate cylinder or track is called seek time. Once the head is at right track, it must wait until the desired block rotates under the read-write head. This delay is latency time.
26	**Define rotational latency and disk bandwidth.Ans:** Rotational latency is the additional time waiting for the disk to rotate the desired sector to the disk head. The disk bandwidth is the total number of bytes transferred, divided by the time between the first request for service and the completion of the last transfer.
27	**How free-space is managed using bit vectorimplementation?List its advantages. (Apr/May 2018)** **Ans:** The free-space list is implemented as a bit map or bit vector. Each block is represented by 1 bit. If the block is free, the bit is 1; if the block is allocated, the bit is 0. **Advantages:** It is relatively simple and its efficiency in finding the first free block or n consecutive free blocks on the disk.
28	**Define Spooling.**

	Ans: A spool is a buffer that holds output for a device, such as printer,that cannot accept interleaved data streams. When an application finishes printing, the spooling system queues the corresponding spool file for output to the printer. The spooling system copies the queued spool files to the printer one at a time.
29	**What are the various disk-scheduling algorithms?Ans:** The various disk-scheduling algorithms are • First Come First Served Scheduling • Shortest Seek Time First Scheduling • SCAN Scheduling • C-SCAN Scheduling • LOOK scheduling
30	**What is the use of boot block?Ans:** For a computer to start running when powered up or rebooted it needs to have an initial program to run. This bootstrap program tends to be simple. It finds the operating system on the disk loads that kernel into memory and jumps to an initial address to begin the operating system execution. The full bootstrap program is stored in a partition called the boot blocks, at fixed location on the disk. A disk that has boot partition is called boot disk or system disk.
31	**List three ways of allocating storage, and give advantages ofeach.** **Ans:** a. Contiguous allocation. Fastest, if no changes are to be made.Also easiest for random access files. b. Linked allocation. No external fragmentation. File can growwithout complications. c. Indexed allocation. Supports direct access without externalfragmentation.
32	**Define typical bad sector transaction.Ans:** • The operating system tries to read logical block 87. • The controller calculates the ECC and finds that thesector is bad, It reports this finding to the OS. • The next time the system is rebooted, a special command

	is run to tell the controller to replace the bad sector witha space. • After that, whenever the system requests logical block87, the request is translated into the replacement sector's address by the controller.
33	**List the significance of LDT and GDT in segmentation. (Nov/Dec 2018)** **Ans:** LDT contains memory segments which are private to a specific program, the GDT contains global segments. The x86 processors have facilities for automatically switching the current LDT on specific machine events, but no facilities for automatically switching the GDT.
34	**What is a Path Name?Ans:** A pathname is the path from the root through all subdirectories to a specified file. In a two-level directory structure a user nameand a file name define a path name.
35	**What is Access Control List?Ans:** The most general scheme to implement identity-dependent access is to associate with each file and directory an accesscontrol unit.
36	**Define Equal Allocation.Ans:** The way to split „m' frames among „n' processes is to give everyone an equal share, m/n frames. For instance, if there are 93 frames and 5 processes, each process will get 18 frames. The leftover 3 frames could be used as a free-frame buffer pool. This scheme is called equal allocation.
37	**What is the cause of Thrashing? How does the system detect thrashing? Once it detects thrashing, what can the system doto eliminate this problem?** **Ans:** Thrashing is caused by under allocation of the minimum number of pages required by a process, forcing it to continuously page fault. The system can detect thrashing by evaluating the level of CPU utilization as compared to the level of multiprogramming.

	It can be eliminated by reducing the level of multiprogramming.
38	**If the average page faults service time of 25 ms and amemory access time of 100ns.Calculate the** **effective access time.Ans:** Effective access time = (1-p) *ma + p*page fault time = (1-p) *100+p*25000000 = 100-100p+25000000*p = 100 + 24999900p
39	**What is Belady’s Anomaly?Ans:** For some page replacement algorithms, the page fault rate may increase as the number of allocated frames increases
40	**What are the types of Path Names?Ans:** Path names can be of two types. Absolute path name: Begins at the root and follows a path downto the specified file, giving the directory names on the path. Relative path name: Defines a path from the current directory.
41	**What is meant by Locality of Reference?Ans:** The locality model states that, as a process executes, it moves from locality to locality. Locality is of two types.Spatial locality Temporal locality.
42	**What are the advantages of Contiguous Allocation?Ans:** The advantages are,

	Supports direct access Supports sequential access Number of disk seeks is minimal.
43	**What are the drawbacks of Contiguous Allocation of DiskSpace?** **Ans:** The disadvantages are, Suffers from external fragmentation Suffers from internal fragmentation Difficulty in finding space for a new fileFile cannot be extended Size of the file is to be declared in advance
44	**What are the advantages of Linked Allocation?Ans:** The advantages are, No external fragmentation Size of the file does not need to be declared
45	**What are the disadvantages of Linked Allocation?Ans:** The disadvantages are, Used only for sequential access of files.Direct access is not supported Memory space required for the pointers. Reliability is compromised if the pointers are lost or damaged
46	**What are the various Disk-Scheduling Algorithms?Ans:** The various disk-scheduling algorithms are,

	First Come First Served Scheduling Shortest Seek Time First SchedulingSCAN Scheduling C-SCAN Scheduling LOOK scheduling
47	**What are the techniques used for performing I/O.** **Ans:** Programmed I/O Interrupt driven I/O Direct Memory Access
48	**Give an example of an application in which data in a fileshould be accessed in the following order:** **Ans:** Sequentially - Print the content of the file. Randomly - Print the content of record i. This record can befound using hashing or index techniques.
49	**What problems could occur if a system allowed a file system to be mounted simultaneously at more than one location?** **Ans:** There would be multiple paths to the same file, which could confuse users or encourage mistakes. (Deleting a file with one path deletes the file in all the other).
50	**Why must the bit map for file allocation be kept on mass storage rather than in main memory?** **Ans:** In case of system crash (memory failure), the free-space list would not be lost as it would be if the bit map had been stored inmain memory