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Operating System Fundamentals

BCA Part-I

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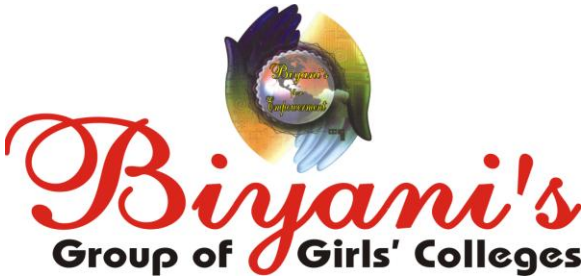

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Preface

I am glad to present this book, especially designed to serve the needs of the students. The book has been written keeping in mind the general weakness in understanding the fundamental concepts of the topics. The book is self-explanatory and adopts the "Teach Yourself" style. It is based on question-answer pattern. The language of book is quite easy and understandable based on scientific approach.

Any further improvement in the contents of the book by making corrections, omission and inclusion is keen to be achieved based on suggestions from the readers for which the author shall be obliged.

I acknowledge special thanks to Mr. Rajeev Biyani, *Chairman* & Dr. Sanjay Biyani, *Director* (*Acad.*) Biyani Group of Colleges, who are the backbones and main concept provider and also have been constant source of motivation throughout this Endeavour. They played an active role in coordinating the various stages of this Endeavour and spearheaded the publishing work.

I look forward to receiving valuable suggestions from professors of various educational institutions, other faculty members and students for improvement of the quality of the book. The reader may feel free to send in their comments and suggestions to the under mentioned address.

Author

Syllabus

B.C.A. Part-I

Operating System Fundamentals

Necessity of an **Operating system**; Operating System Terminology, Evolution of Operating Systems (Multiprogramming Systems, Batch Systems, Timesharing System, Process Control and Real-Time System). Factors in OS Design (Performance, Protection and Security; Correctness, Maintainability, Application Integration, Portability and Interoperability).

Device Management : General Device Characteristics, I/O Programming Concepts, Device Controllers, Device Drivers, Interrupts Driven I/O System Organization, Direct I/O with Polling, Interrupts Driven I/O, Memory Mapped I/O, Direct Memory Access, Buffering, Device Drivers Interface, CPU Device Interaction, I/O Optimization, Device Management Scenarios (Serial Communications, Sequentially Accessed Storage Devices, Randomly Accessed Devices).

Process Management : Process Definition, Process Control, Initializing Operating System, Process Address Spaces, Process Abstraction, Resource Abstraction and Process Hierarchy.

Scheduling Mechanisms, Partitioning a Process into Small Processes, Non-Preemptive Strategies (First come-First Served, Shortest Job Next, Priority Scheduling, Deadline Scheduling), Preemptive strategies (Round Robin, Two Queues, Multiple Level Queues).

Basic Synchronization Principles : Interactive Processes, Coordinating Processes, Semaphores, Shared Memory Multiprocessors, AND Synchronization, Inter-process Communication, Inter-process Messages, Mailboxes.

Deadlocks, Resource Status Modeling, Handling Deadlocks, Deadlock Detection and Resolution Deadlock Avoidance.

Memory Management : Requirements on the Primary Memory, Mapping the Address Space to Primary Memory, Dynamic Memory for Data Structures, Memory Allocation (Fixed Partition Memory Allocation Strategy), Dynamic Address Relocation, Memory Manager Strategies (Swapping, Virtual Memory, Shared Memory Multiprocessors).

Virtual Memory : Address Translation Paging, Static and Dynamic Paging Algorithms.

Information Management : Files (Low Level Files, Structured Files, Database Management Systems, Multimedia Storage). Low Level File Implementation. Storage Abstraction (Structure Sequential Files, Indexed Sequential Files, Database Management Systems, Multimedia Documents). Memory Mapped Files, Directories, Directory Implementation, File Sharing, Sharing Information Across Network, Remote Viruses and Worms, Security Design Principles, Authentications, Protection Mechanisms, Encryption, Protection of User Files.

Distributed Computing : Distributed Process Management, Message Passing, Remote Procedure Call, Distributed Memory Management, Security in Distributed Environment. □ □ □

Content

S.No.	Name of Topic	
	Examination Paper 2007	
1.	**Operating System Introduction**	
	1.1	Introduction to Operating System
	1.2	Necessity of an Operating System
	1.3	Evolution of Operating System
	1.4	Factors in OS Design
2.	**Process Management**	
	2.1	Process Definition
	2.2	Process States
	2.3	Process Control Block
	2.4	Process Address Spaces
	2.5	Process Hierarchy
3.	**Scheduling Mechanisms**	
	3.1	Requirement of CPU Scheduling
	3.2	CPU Bound and I/O Bound Processes
	3.3	Scheduling Queues
	3.4	Types of Schedulers Criteria
	3.5	Performance Criteria for Scheduling Mechanism
	3.6	Non-Preemptive Scheduling Mechanism
	3.7	Preemptive Scheduling Mechanisms
4.	**Basic Synchronization Principles**	
	4.1	Concept of Synchronization
	4.2	Co-operating Processes
	4.3	Semaphores and its Usage
	4.4	AND Synchronization
	4.5	Inter-process Communication
	4.6	Direct and Indirect Inter-process Communication
5.	**Deadlocks**	

	5.1	Introduction to Deadlock
	5.2	Necessary Conditions for Deadlock
	5.3	Handling Deadlocks
	5.4	Deadlock Prevention
	5.5	Deadlock Avoidance
	5.6	Deadlock Detection
	5.7	Recovery from Deadlock
6.	**Device Management**	
	6.1	Concept of Device Management
	6.2	General Device Characteristics
	6.3	Data Transfer Schemes between CPU and I/O Devices
	6.4	Synchronous and Asynchronous Data Transfer
	6.5	Device Controller
	6.6	Device Drivers
	6.7	Interrupts
	6.8	Direct I/O and Memory Mapped I/O
	6.9	Buffering
	6.10	Direct Memory Access (DMA)
	6.11	I/O Optimization Techniques
7.	**Memory Management**	
	7.1	Logical v/s Physical Address Space
	7.2	Memory Allocation Techniques
	7.3	External and Internal Fragmentation
	7.4	Swapping
	7.5	Virtual Memory
	7.6	Paging
	7.7	Demand Paging
	7.8	Page Replacement Algorithm

8.	**Information Management**	
	8.1	Files
	8.2	Contiguous, Linked and Indexed Allocation
	8.3	Directories
	8.4	Types of Directory
	8.5	Sharing Information Across the Network
	8.6	Remote Disk System
	8.7	Remote File System
	8.8	File Level Caching
	8.9	Security Threats
	8.10	Viruses and Worms
	8.11	Security Design Principles
	8.12	Authentication
	8.13	Protection Mechanisms
	8.14	Encryption
9.	**Distributed Systems**	
	9.1	Distributed Systems Definition
	9.2	Advantages of Distributed Systems
	9.3	Distributed Process Management
	9.4	Message Passing System
	9.5	RPC
	9.6	Memory Management in Distributed Environment
	9.7	Security Requirements of Distributed Systems
10.	**Unsolved Papers 2011 to 2006**	

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CHAPTER-1

Operating System Introduction

Q.1 What is the difference between Application and System Software?

Ans.: Application Software and System Software : The **Application Software** is a software developed to provide solutions to a particular application. These softwares are usually developed for a specific area, they cannot be used in other application areas.

For example - Tally for Accounting, MS-Word for Word Processing etc.

While the **System Software** helps in controlling the internal processing of the computer, these softwares provide a general programming environment in which programmers can write applications to suit their needs.

Examples of System Software are - Operating Systems, Language Translators etc.

Q.2 What do you mean by Operating System?

Ans.: Operating System : An **Operating System** is a program that acts as an intermediary between a user of a computer and the computer hardware.

The **purpose of an Operating System** is to provide an environment in which a user can execute program. An Operating System is an important part of almost every Computer System.

It is basically a control program that controls the execution of user programs to prevent errors and improper use of the computer.

Q.3 What is the necessity of an Operating System?

Ans.: Necessity of an Operating System : Computer System performs all the tasks with the help of hardware and software jointly. To use computer in different

application areas, a user has to write proper software. A user who is writing a program or a software need to know about details of hardware, which is a very difficult task. Therefore there should be an intermediate component between user and computer hardware.

The execution of all commands given by the user and all instructions given by various softwares are the **responsibility of Operating System**.

Operating System provides various services like program execution, I/O operations, resource allocation etc. for convenience of user or efficient operations of system itself.

Q.4 Write in brief about the Evolution of Operating System.

Ans.: Evolution of Operating System : The evolution of various types of operating systems can be briefly described as follows :

(1) **Batch System :** This type of Operating System was used in the earlier age. To speed up processing, jobs with similar needs were batched together and were run through the computer as a group. The definitive feature of a batch system is the lack of interaction between the user and the job while that job is executing. In this execution environment, the CPU is often idle.

(2) **Multiprogramming System :** In this type of Operating System, more than one programmes will reside into main memory. The Operating System picks and begins to execute one of the jobs in the memory. Eventually, the job may have to wait for some task, the Operating System simply switches to and executes another job. When the first job finishes waiting and gets the CPU back. As long as there is always some job to execute, the CPU will never be idle.

(3) **Time Sharing System :** A Time-Shared Operating System allows the many users to share the computer simultaneously. A time-shared Operating System uses CPU scheduling and multiprogramming to provide each user with a small portion of a time-shared computer.

(4) **Real Time Operating System :** Real Time Operating System is a special purpose Operating System, used when there are rigid time requirements on the operation of a processor or the flow of data.

(5) **Process Control System :** Process Controls are dedicated Systems. They are dedicated to single application. Thus there is no need to manage sharing among concurrent application programs.

(6) **Distributed System :** A Distributed System is an interconnection of two or more nodes, but the processors do not share memory. These Systems are also called as loosely **Coupled Systems.**

Q.5 Explain the various factors which should keep in mind while designing the Operating System.

Ans.: When we are designing an Operating System, we need to keep in mind certain important factors. The few important **factors** are :

(i) Performance

(ii) Protection and Security

(iii) Correctness

(iv) Maintainability

(v) Application integration

(vi) Portability

(vii) Interoperability

□ □ □

Multiple choice Question

Q1. The operating system which the IBM –PC uses:

A. **CP/M**
B. MS-DOS
C. UNIX
D. AT-DOS

Q2.Most operating system are designed to run with a specific:

A. Type of processor
B. Manufacturer's printer
C. Brand of computer
D. Style of keyboard

Q3.A technique that can be used when a very long program exceeds the storages capacity of memory is called:

A. Windowing
B. Time sharing
C. Linkage editing
D. Virtual memory

Q4.An operating system designed for uase on both PC's at home andon serversin business is:

A. Windows XP
B. Windows ME
C. Windows NT
D. Windows CE

Q5. The address, which CPU ,generates is called as:

A. Physical address

B. Actual address

C. Logical address

D. None of the above

CHAPTER-2

Process Management

Q.1 Write the Definition of Process.

Ans.: Process Definition : In general, a process is a program in execution. The execution of a process progresses in a sequential fashion. Thus a process is an active entity with a program counter, specifying the next instruction to be executed and a set of associated resources.

Q.2 Explain the different States of Process with example.

OR

Describe about the Life Cycle of a Process.

Ans.: Process States : The various stages through which a process passes is called its **Life Cycle** and this Life Cycle of a process can be divided in to several stages called as **"Process States".** When a process starts execution, it goes through one state to another state. Each process may be in one of the following states :

(i) New (ii) Ready (iii) Running

(iv) Waiting (v) Terminated

Q.3 Explain the Process Control Block (PCB) with diagram.

Ans.: Process Control Block (PCB) : To control the various processes the Operating System maintains a table called the **Process Table**. The Process Table contains one entry per process. These entries are referred to as **"Process Control Block".** It contains many pieces of information related with a specific process including

the *Process Number, Process State, Program Counter, CPU Registers, CPU Scheduling Information, Memory Management Information, Accounting Information, and I/O Status Information.*

Q.4 Explain the Process Address Space in brief.

Ans.: Process Address Space : When we write programs, very frequently we use defined libraries (programs). When we execute a program then an executable program is prepared by linking the modules. The procedure for linking the modules are defined in a linear address space in which all parameters of computation are referred.

Thus Address Space is a set of locations used by process to reference. The Address Space defines all logical entities used by process and specifies addresses by which they are referred.

Q.5 What do you understand by Process Hierarchy?

Ans.: Process Hierarchy : Operating System needs some way to create and kill processes. When a process is created, it creates another process which in turn creates some more processes and so on. Thus it forms a **Process Hierarchy or Process Tree.** In this hierarchy a child process can have only one parent process where as a parent process can have multiple child processes.

□ □ □

Multiple Choice Questions

Q1. Process Manager is responsible for
- A. Scheduling of process
- B. Synchronization
- C. deadlock handling
- D. **All**

Q2. PCB stands for
- A. Program Control Block
- B. Process Control Bus
- **C.** Program Control Bus
- **D. Process Control Block**

Q3. Process is a
- A. Program
- B. Hardware
- C. **Program under execution**
- D. None

Q4. The various states of process are:
- A. New, Ready
- B. New, Ready, Running
- C. New, Running, Terminated
- D. **New, Ready, Running, waiting, Terminated**

Q5. The various queues are-
- A. Job Queue
- B. Ready queue
- C. Device queue
- **D. All**

Q6. CPU resource management is known as
- A. **Scheduling**
- B. I/O Management
- C. Swapping
- D. None

Q6. Different way of creating and deleting process are
A. FORK
B. JOIN
C. QUIT
D. **All**

Q7. Which of the following is also called as lightweight processes:-
A. Function
B. Application Module
C. Kernel
D. **Thread**

Q8. Thrashing is related to:
A. Cache memory
B. Main memory
C. Secondary memory
D. Virtual memory

Q9. Which of the following is not a system utility?
A. Compiler
B. Interpreter
C. Operating system
D. Internet explorer

Q10.FSCAN is a:
A. Disk checking mechanism
B. Disk clearing mechanism
C. Disk formatting mechanism
D. Disk scheduling mechanism

CHAPTER-3

Scheduling Mechanisms

Q.1 What is the requirement of CPU Scheduling? Explain.

Ans.: CPU Scheduling : CPU Scheduling is the basis of multi Programmed Operating System. By switching the CPU among the processes, the operating system can make the computer more productive. The main **objective of Scheduling** is to increase CPU utilization and higher throughput.

Q.2 What is the difference between CPU Bound and I/O Bound Processes?

Ans.: I/O Bound Processes : An I/O Bound Process is one that spends more of its time in doing I/O then it spends on doing computation.

CPU bound Processes : CPU Bound Processes needs very little I/O, but requires heavy computation.

Q.3 What are the different types of Scheduling Queues?

Ans.: The **Scheduling Queues in the Systems** are :

(1) **Job Queue :** As processes enters in the System, they are put into a job queue.

(2) **Ready Queue :** The processes that are residing in the main memory and are ready and waiting to execute are kept in the ready queue.

(3) **Device Queue :** This queue contains a list of processes waiting for I/O devices.

Q.4 Write about the different types of Schedulers.

Ans.: Types of schedulers : There are basically three types of schedulers :

(1) **Long Term Scheduler :** This Scheduler determines which job will be submitted for immediate processing. It selects from the job pool and loads them into memory.

(2) **Short Term Scheduler :** It is also called a **CPU Scheduler.** It allocates processes belonging to ready queue to CPU for immediate processing.

(3) **Medium Term Scheduler :** It is also called as **Memory Scheduler.** During the execution processes are swapped-out and swapped-in by the Medium Term Scheduler.

Q.5 What are the different criteria for measuring the Performance of Scheduling Mechanism?

Ans.: Performance Criteria for Scheduling Mechanism : The various criteria for measuring the Scheduler Performance are :

(i) CPU Utilization

(ii) Throughput

(iii) Turnaround Time

(iv) Waiting Time

(v) Response Time

Q.6 Differentiate between Non-Preemptive and Preemptive Scheduling Mechanism.

Ans : Non-Preemptive Scheduling Mechanism : A Non-Preemptive Scheduling Mechanism selects a process to run and lets it run, until it blocks or until it voluntarily releases the CPU.

Preemptive Scheduling Mechanism : In this category, suspension or preemption is allowed based on priority.

Q.7 Explain various Non-preemptive Scheduling Mechanisms.

Ans.: Non-Preemptive Scheduling Mechanisms are of four types :-

(1) **First Come First Served (FCFS) Scheduling :** With this scheme, the process that requests the CPU first is allocated the CPU first.

(2) **Shortest-Job First (SJF) Scheduling :** In this scheme, job requiring the minimal CPU time is selected first for CPU allocation.

(3) **Priority Scheduling :** In this scheme a priority is associated with each process and the CPU is allocated to the process with the highest priority.

(4) **Deadline Scheduling :** With this scheduling algorithm the process with earliest deadline is given the highest priority for execution.

Q.8 Explain various Preemptive Scheduling Mechanisms.

Ans.: Preemptive Scheduling mechanisms are of three types :-

(1) **Round-Robin Scheduling :** In this algorithm, a small time slice is assigned to each process. The CPU scheduler goes around the ready queue, allocating the CPU to each process for a time interval of one time quantum.

(2) **Two Queue Scheduling :** In this approach, the processes are classified into two different groups. One queue is allocated to CPU bound processes and other is allocated to I/O bound processes.

(3) **Multilevel Queue Scheduling :** A Multilevel Queue Scheduling Algorithm partition the ready queue in to separate queues and each queue has its own scheduling algorithms.

□ □ □

Multiple Choice Questions

Q1. Operating System is a :

a. Hardware
b. **System Software**
c. Application Software
d. None

Q2. Which of the following is not an example of Operating System?
a. Windows 95
b. DOS
c. UNIX
d. **MS Word**

Q3. Operating System is required to manage-
a. Hardware
b. various resources
c. memory
d. **All**

Q4. Factors important for designing of Operating systems are
a. Maintainability
b. Portability
c. security
d. **All above**

Q5. Which one is a sequential storage device::
A. Hard disk
B. Magnetic disk
C. Magnetic tape
D. None of the above

Q6. System in which different part of a single program can run concurrently is:
A. Real time
B. Multitasking

C. Multithreading
D. None of the above

Q7. Which of the following is not an operating system?
A. WINDOWS
B. UNIX
C. PASCAL
D. MS-DOS

Q8. Which of the following is also known as "Light weight process"?
A. Function
B. Application module
C. Kernel
D. Thread

Q9. The……. Is a computer program that runs when you first start the computer;
A. FAT
B. Record
C. Boot record
D. Root directory

Q10. Thrashing is related to :
A. Cache Memory
B. Main Memory
C. Secondary memory
D. Virtual memory

CHAPTER-4

Basic Synchronization Principles

Q.1 Explain the concept of Synchronization.

Ans.: Synchronization : The concept of Synchronization is concerned with co-operating processes that share some resources. Co-operating processes must synchronize with each other when they use shared resources. Thus we can view the **Synchronization** as a set of constraints on the ordering of events.

Q.2 What do you mean by Co-operating Processes?

Ans.: Co-operating Processes : The concurrent processes executing in the Operating System may be either **Independent Processes or Co-operating Processes.**

A process is **Co-operating** if it can affect or is affected by the other processes executing in the System.

That means any process that shares data with other processes is a **Co-operating Process.**

Q.3 Write about Semaphores and its usages.

Ans.: Semaphores : A Semaphore is a protected variable whose value can be accessed and altered only by operations P and V.

A **Semaphore Mechanism** basically consists of the two primitive operations **SIGNAL** and **WAIT**.

The Semaphore variable can assume only positive integer value. The integer value of the Semaphore in the wait and signal operations must be executed indivisible.

That is, when one process modifies the Semaphore value, no other process can simultaneously modify that same Semaphore value.

Usage :

(i) Semaphores can be used to deal with n process critical section problem. As the n processes shares the semaphores, mutex (standing for mutual exclusion), is initialized to 1.

(ii) Semaphores can also be used to solve various synchronization problems.

Q.4 What do you mean by AND Synchronization?

Ans.: AND Synchronization : In case of AND Synchronization, a single abstract P operation could not be used to obtain all required resources at once or none of them at all. The operation would block the calling process whenever any of the resource could not be obtained.

Q.5 Explain the concept of Inter-Process Communication.

Ans.: Inter-Process Communication : Cooperating processes can communicate in a shared-memory environment. Cooperating processes communicate with each other via an **Inter-Process-Communication (IPC)** facility. IPC provides a mechanism to allow processes to communicate and to synchronize their actions. Inter-Process Communication is best provided by a **Message System**. Message System can be defined in many different ways. An IPC facility provides at least the two operations - **send(message)** and **receive(message).**

Q.6 What is the difference between Direct and Indirect Inter-Process Communication?

Ans.: Direct Communication : In the Direct Communication, each process that wants to communicate must explicitly name the recipient or sender of the communication. In this scheme, the **send and receive** primitives are defined as follows :

Send (P, message) - Send a message to process P.

Receive (Q, message) - Receive a message from process Q.

Indirect Communication : With Indirect Communication, the messages are sent to and received from mailboxes. A mailbox can be viewed abstractly as, an object into which messages can be placed by processes and from which messages can be removed. The send and receive primitives are defined as follows :

Send (A, message) - Send a message to mailbox A.

Received (A, message) - Receive a message from mailbox A.

□ □ □

Multiple Choice Questions

Q1. Real time operating systems are mainly used in :

A. EDP Processing

B. Office automation

C. Industry

D. Day-to-day life

Q2. CPU resource management is also known as:

A. Scheduling

B. I/O Management

C. Swapping

D. All of the above

Q3. The minimum number of bits required to represent 34 is:

A. 6

B. 8

C. 5

D. 7

Q4. The typical RAM capacity of a PC is of the order of:

A. 64 KB

B. 64 MB

C. 1 TB

D. 16 GB

Q5. OSI model has got:

A. 4 layers

B. 6 layers

C. 7 Layers

D. 3 Layers

Q6.The operating system which the IBM-PC uses:

A. CP/M

B. MS/DOS

C. UNIX

D. AT-DOS

Q7. Netware is a:

A. Protocol

B. Route

C. Network operating system

D. None of the above

Q8.Disadvantege of distributed system are:

A. Complex software

B. Costly networking

C. Complex security

D. All of the above

Q9: Device driver is a:

A. Hardware

B. Software

C. A & b Both

D. None of the above

Q10.LAN speed are measured in:

A. Bps

B. Kbps

C. Gbps

D. mbps

CHAPTER-5

Deadlocks

Q.1 What is the Deadlock Situation? Explain.

Ans.: Deadlock : In a multiprogramming environment, several processes may compete for a finite number of resources. A process requests resources; if the resources are not available at that time, the process enters a wait state. It may happen that waiting processes will never again change state, because the resources they have requested are held by other waiting processes. Then this is called **Deadlock Situation.**

Q.2 What are the necessary conditions to Produce a Deadlock?

Ans.: Necessary Conditions for Deadlock : A Deadlock Situation can arise if the following four conditions hold simultaneously in a system :

(1) **Mutual exclusion :** At least one resource must be held in a non-sharable mode; that is, only one process at a time can use the resource.

(2) **Hold and wait :** There must exist a process that is holding at least one resource and is waiting to acquire additional resources that are currently being held by other processes.

(3) **No preemption :** Resources cannot be preempted; that is, a resource can be released only voluntarily by the process holding it, after that process has completed its task.

(4) **Circular wait :** There must exist a set $\{P_0, P_1, \ldots, P_n\}$ of waiting processes such that P_0 is waiting for a resource that is held by P_1, P_1 is waiting for a

resource that is held by P_2, . . ., P_{n-1} is waiting for a resource that is held by P_n, and P_n is waiting for a resource that is held by P_0.

Q.3 What are the methods of Handling a Deadlock?

Ans.: Methods of Handling Deadlocks : There are three different methods for dealing with the Deadlock problem :

- We can use a protocol to ensure that the system will never enter a Deadlock state.
- We can allow the system to enter a Deadlock state and then recover.
- We can ignore the problem all together, and pretend that Deadlocks never occur in the System.

Q.4 Write the methods to Prevent a Deadlock Situation.

Ans.: Methods to Prevent a Deadlock Situation : For a Deadlock to occur, each of the four necessary-conditions must hold. By ensuring that at least one of these conditions cannot hold, we can prevent the occurrence of a Deadlock.

(1) **Mutual Exclusion :** The mutual-exclusion condition must hold for non-sharable resources. Sharable resources, on the other hand, do not require mutually exclusive access, and thus cannot be involved in a Deadlock.

(2) **Hold and Wait :** Whenever a process requests a resource, it does not hold any other resource. An alternative protocol allows a process to request resources only when the process has none.

(3) **No Preemption :** If a process that is holding some resources requests another resource that cannot be immediately allocated to it, then all resources currently being held are released implicitly. Then the preempted resources are added to the list of resources for which the process is waiting.

(4) **Circular Wait :** Circular-Wait condition never holds to impose a total ordering of all resource types, and to require that each process requests resources in an increasing order of enumeration.

Q.5 How can a Deadlock Situation be avoided?

Ans.: Deadlock Avoidance : Avoiding Deadlocks is to require additional information about how resources are to be requested. A Deadlock-Avoidance algorithm dynamically examines the resource-allocation state to ensure that there can never be a circular wait condition. The resource allocation state is defined by the number of available and allocated resources, and the maximum demands of the processes. There are various methods used for the **purpose of Deadlock Avoidance :**

(1) **Safe State :** A state is safe if the System can allocate resources to each process (up to its maximum) in some order and still avoid a Deadlock. More formally, a System is in a **safe** state only if there exists a safe sequence. If no such sequence exists, then the System state is said to be **unsafe**.

(2) **Resource-Allocation Graph Algorithm :** Suppose that process Pi requests resource Rj. The request can be granted only if converting the request edge Pi ⟶ Rj to an assignment edge Rj⟶ Pi does not result in the formation of a cycle in the Resource-Allocation Graph.

(3) **Banker's Algorithm :** This Resource-Allocation Graph Algorithm is applicable to a Resource-Allocation System with multiple instances of each resource type. This algorithm is commonly known as the **Banker's Algorithm.**

Q.6 Write the methods for Detecting a Deadlock.

Ans.: Deadlock Detection : If a system does not employ either a Deadlock-Prevention or a Deadlock Avoidance Algorithm, then a Deadlock Situation may occur. In this environment -

- An algorithm that examines the state of the system to determine whether a Deadlock has occurred.
- An algorithm to recover from the Deadlock.

Single Instance of Each Resource Type : If all resources have only a single instance, then we can define a Deadlock Detection Algorithm that uses a variant of the Resource-Allocation Graph, called a **Wait-For Graph.** We obtain this graph

from the Resource-Allocation Graph by removing the nodes of type resource and collapsing the appropriate edges.

Several Instances of a Resource Type : The Wait-For Graph Scheme is not applicable to a Resource-Allocation System with multiple instances of each resource type.

The algorithms used are :

- Available
- Allocation
- Request

Q.7 What are the methods of recovery from deadlock?

Ans.: Recovery from Deadlock : When a Detection Algorithm determines that a Deadlock exists, several alternatives exist for recovery.

One possibility is to inform the operator that a Deadlock has occurred, and to let the operator deal with the Deadlock manually.

The other possibility is to let the System recover from the Deadlock automatically.

There are **two options** for breaking a Deadlock. **One solution** is simply to abort one or more processes to break the circular wait. The **second option** is to preempt some resources from one or more of the Deadlocked processes.

□ □ □

Multiple Choice Question

Q1. The major security threats are
- A. Unauthorized use of service
- B. Unauthorized disclosure of information
- C. Unauthorized alteration of information
- **D. All of the above**

Q2. Remote Procedure Call (RPC) is
- A. Communication in centralized system
- B. **Communication in distributed system**
- C. Both (a) and (b) both
- D. None of the above

Q3. A file can have following states:-
- A. closed
- B. opened
- C. achieved
- **D. All above**

Q4. The operation performed on directory is
- A. creation
- B. deletion
- C. open
- D. **all**

Q5. DBMS is used because of
- A. consistency
- B. data independency
- C. controlled redundancy
- **D. all**

Q6.Multimedia application can involves

a. audio b. video c. text d. **all**

Q7. The advantage of distributed system is-

a. more computing power b. Reliability
c. Resource sharing d. **All**

Q8. RPC stands for

a. Remote Programming center b. **Remote Procedure Call**
c. Right Program Call d. None

Q9.In the batch processing system the task are submitted in:

A. one by one
B. similar task in batches
C. different task in batches
D. none of the above

Q10.Which type of file organization aresupported by magnetic tape:

A. Random file
B. Contiguous sequential file
C. Indexed sequential file
D. All of the above

CHAPTER-6

Device Management

Q.1 Explain the concept of Device Management.

Ans.: Device Management : One of the **main function of Operating System** is to control all the I/O (Input/Output) devices of computer.

The **I/O System or Device Manager** is a part of the Operating System which is related with management of I/O devices.

The I/O System of an Operating System is **responsible for the task** of attending to the individual requirements of I/O devices and providing for their efficient and reliable operations.

In order to manage the I/O devices, the Operating System creates a **Device Status Table.** This table contains the information such as which device is free and which one is busy.

Q.2 Define General Device Characteristics.

Ans.: General Device Characteristics : Generally, most I/O devices share **two important characteristics,** that largely define the I/O problems, which are **asynchronous operations** and **the speed gap.**

The I/O devices operate **asynchronously** from the processor because the processor, I/O data arrival and transfer time are generally unpredictable.

The **speed gap** incompatibility between any two I/O devices can also arise because of the difference in the electrical characteristics of two devices. The timing difference between devices may also arise because of the difference in data transfer speed.

Q.3 Define various Schemes to Transfer Data between CPU and I/O Devices.

Ans.: Data Transfer Schemes between CPU and I/O Devices : A computer having multiple devices may have time incompatibility problem. Hence some schemes are used for transferring data between CPU and I/O devices.

These schemes fall into two categories :

(i) Programmed Data Transfer (PDT)

(ii) Direct Memory Access Transfer (DMA)

Q.4 Differentiate between Synchronous and Asynchronous Data Transfer.

Ans.: Synchronous Data Transfer : It is used when the I/O devices and CPU speed matches. Whenever data is to be collected or delivered to the device, the user program issue suitable instructions addressing the device. At the end of the execution of this instruction the transfer get completed.

Asynchronous Data Transfer : When the speed of I/O devices and CPU do not match then generally Asynchronous Data Transfer method is used. In this method, CPU issues **"get ready"** instruction to the device. Then the CPU keeps waiting until the device is ready. Once the device is ready, CPU issues data transfer instruction immediately. To see whether the device is ready, CPU needs to test signals. Thus this is also called as handshaking scheme.

Q.5 What is the use of Device Controller?

Ans.: Device Controller : Each device uses a **Device Controller** to connect devices to computer data and address bus. The controller provides a set of physical

components that CPU instruction can manipulate to perform I/O operations. Generally Operating System deals with the Controller and not the Device.

Q.6 What is the use of Device Driver?

Ans.: Device drivers : Each I/O device attached to a computer needs some device specific code for controlling it. This code is called the **Device Driver.** It is generally written by the device's manufacturer and delivered along with the device. Each Device Driver normally handles one device type or one class of closely related devices.

Q.7 What is the role of Interrupt in Computer?

Ans.: Interrupts : Interrupt is the ability of the hardware to stop the currently running program and turn the system's attention to something else. If a block of data is to be read from an input device it may take a lot of time between two bytes of data to be available to processor. During this time interval, microprocessor can do some other work. The I/O device must then inform the processor, each time that it is ready with the new bytes of data, rather than the microprocessor waiting for the data to appear. The microprocessor then discontinues whatever work it is doing and attends to the required I/O device. It then once again goes back to the place where it left and continues the original processing.

Q.8 What do you mean by Direct I/O and Memory Mapped I/O?

Ans.: Direct I/O with Polling : Direct I/O refers to the method of doing I/O whereby the CPU is responsible for determining when the I/O operation has completed and then for transferring the data between the primary memory and the device controller data registers.

Memory-Mapped I/O : An I/O device is managed by having software read/write information from/to the controller's registers. Each controller has a few registers that are used for communicating with the CPU. Each control

register is assigned a unique memory address to which no memory is assigned. This system is called **Memory-Mapped I/O**. In Memory-Mapped System, devices are associated with logical primary memory addressees rather than having a specialized device address. Each component of the device that is referenced using software is assigned a normal memory address.

Q.9 What do you mean by Buffering?

Ans.: Buffering: - A **buffer** is a memory area that stores data while they are transferred between two devices or between a device and an application. It is a technique, which is used in the operating system to bridge the gap between the slow I/O devices and the fast processor. Buffering attempts to keep both CPU and I/O devices busy all time.

Q.10 What is DMA? Explain.

Ans.: Direct Memory Access (DMA) : In DMA the controllers are able to read and write information directly from/to primary memory with no CPU intervention. When the processor wishes to read or write a block of data, it issues a command to the DMA module. The DMA module transfers the entire block of data, one word at a time, directly to or from memory, without going through the processor. When the transfer is complete, the DMA module sends an interrupt signal to the processor. Thus, the processor is involved only at the beginning and end of the transfer.

Q.11 Explain various Disk Scheduling Algorithms in brief.

OR

Explain various I/O Optimization Techniques.

Ans.: **I/O optimization Techniques :** The various Disk Scheduling Algorithms in order to minimize total service time and wait time are as follows :

(1) **First-In-First-Served :** The **simplest form** of scheduling is First-In-First-Out (FIFS) scheduling, which processes items from the queue in sequential order .

(2) **Shortest Seek Time First :** The SSTF policy is to select the disk I/O request that requires the least movement of the disk arm from its current position.

(3) **Scan :** In this scheme, the read/write keeps moving from one end to another end and when it reaches to the other end, the direction of head movement is reserved and servicing continues.

(4) **C-Scan :** The C-SCAN policy restricts scanning to one direction only. Thus, when the last track has been visited in one direction, the arm is returned to the opposite end of the disk and the scan begins again.

□ □ □

Multiple Choice Questions

Q1. Process Manager is responsible for
- E. Scheduling of process
- F. Synchronization
- G. deadlock handling
- H. **All**

Q2. PCB stands for
- E. Program Control Block
- F. Process Control Bus
- **G.** Program Control Bus
- **H. Process Control Block**

Q3. Process is a
- E. Program
- F. Hardware
- G. **Program under execution**
- H. None

Q4. The various states of process are:
- E. New, Ready
- F. New, Ready, Running
- G. New, Running, Terminated
- H. **New, Ready, Running, waiting, Terminated**

Q5. The various queues are-
- E. Job Queue
- F. Ready queue
- G. Device queue
- **H. All**

Q6. CPU resource management is known as
- E. **Scheduling**
- F. I/O Management
- G. Swapping
- H. None

Q6. Different way of creating and deleting process are

E. FORK
F. JOIN
G. QUIT
H. **All**

Q7. Which of the following is also called as lightweight processes:-

E. Function
F. Application Module
G. Kernel
H. **Thread**

Q8. Thrashing is related to:

E. Cache memory
F. Main memory
G. Secondary memory
H. Virtual memory

Q9. Which of the following is not a system utility?

E. Compiler
F. Interpreter
G. Operating system
H. Internet explorer

Q10.FSCAN is a:

E. Disk checking mechanism
F. Disk clearing mechanism
G. Disk formatting mechanism
H. Disk scheduling mechanism

CHAPTER-7

Memory Management

Q.1 What is the difference between Logical and Physical Addresses?

Ans.: Logical versus Physical Address Space : An address generated by the CPU is commonly referred to as a **Logical Address**, whereas an address seen by the memory unit is commonly referred to as a **Physical Address.**

The set of all Logical Addresses generated by a program is referred to as a **Logical Address Space**; the set of all Physical Addresses corresponding to these Logical Addresses is referred to as a **Physical Address Space.**

The user program deals with Logical Addresses. The **Memory-Mapping Hardware** converts Logical Addresses into Physical Addresses.

Q.2 Explain various Memory Allocation Techniques in brief.

Ans.: Memory Allocation Techniques : There are various techniques used for Memory Allocation such as :

(1) **Single-Program Partition Technique :** In single user systems, the memory is usually divided into two partitions, one for the resident operating system, and the other for the user processes. The Operating System is normally residing in low memory, and the user processes are executing in high memory.

(2) **Fixed-Sized Partition Allocation :** One of the simplest schemes for memory allocation is to divide memory into a number of fixed-sized

partitions. Each partition may contain exactly one process. When a partition is free, a process is selected from the input queue and is loaded into the free partition. When the process terminates, the partition becomes available for another process.

The operating system keeps a table indicating which parts of memory are available and which are occupied.

(3) Variable Sized Partition Technique : This technique is more efficient then fixed-sized partition technique. In this technique, when a job is loaded into memory, it is allocated the exact memory space required by it and no more. Hence the partition is created dynamically.

Q.3 Explain the difference between Internal and External Fragmentation.

Ans.: External and Internal Fragmentation : As processes are loaded and removed from memory, the free memory space is broken into little pieces. **External Fragmentation** exists when enough memory space exists to satisfy a request, but it is not contiguous; storage is fragmented into a large number of small holes.

Internal Fragmentation means memory that is internal to partition, but is not being used.

Q.4 What do you mean by Swapping.

Ans.: **Swapping :** In case of **Round Robin CPU-Scheduling or Priority-Based Scheduling** it is required that a process can be swapped temporarily out of memory to a backing store, and then brought back into memory for continued execution. This technique is called **Swapping.** A process is swapped out will be swapped back into the same memory space that it occupies previously. Swapping requires a backing store. The backing store is commonly a fast disk.

Q.5 Explain the concept of Virtual Memory.

Ans.: **Virtual Memory :** Virtual Memory is a technique that allows the execution of process that may not be completely in memory. The main visible advantage of this scheme is that programs can be larger than physical memory.

Virtual Memory is the separation of user logical memory from physical memory. This separation allows an extremely large virtual memory to be provided for Programmers when only a smaller physical memory is available.

Q.6 Explain the Paging Technique in brief.

Ans.: **Paging :** External Fragmentation is avoided by using Paging. In this physical memory is broken into blocks of the same size called **Pages.** When a process is to be executed, its pages are loaded into any available memory frames.

Every address generated by the CPU is divided into any two parts : a **Page Number (P)** and a **Page Offset (D).**

The **Page Number** is used as an index into a page table. The **Page Table** contains the base address of each page in physical memory. The page size like is defined by the hardware. **Paging** is a form of dynamic relocation. Every logical address is bound by the Paging hardware to some physical address.

Q.7 What do you understand by Demand Paging?

Ans.: **Demand Paging :** A Demand Paging is similar to a **Paging System with Swapping.** When we want to execute a process, we swap it into memory. Rather than swapping the entire process into memory. When a process is to be swapped in, the pager guesses which pages will be used before the process is swapped out again instead of swapping in a whole process; the pager brings only those necessary pages into memory. Thus, it avoids reading into memory pages that will not be used in anyway, decreasing the swap time and the amount of physical memory needed.

Q.8 What are the various methods of Page Replacement?

Ans.: **Page Replacement Algorithm :** There are many different Page Replacement Algorithms. Some are :

(1) **FIFO Algorithm :** The **Simplest Page-Replacement Algorithm** is a FIFO Algorithm. A FIFO Replacement Algorithm associates with each page the time when that page was brought into memory. When a page must be replaced, the oldest page is chosen.

(2) **Optimal Algorithm :** An Optimal Page-Replacement Algorithm has the **lowest page-fault rate** of all Algorithms. It is simply replacing the page that will not be used for the longest period of time.

(3) **LRU Algorithm :** The LRU replaces the page that has not been used for the **longest period of time.** LRU replacement associates with each page the time of that page's last use. When a page must be replaced, LRU chooses that page that has not been used for the longest period of time.

□ □ □

Multiple Choice Questions

Q1. To bring program again from disk into the main memory is called:

A. Swapping in

B. Swapping out

C. A and B both

D. None of the above

Q2. A job may be:

A. CPU bound

B. I/O bound

C. Both a & b

D. None of the above

Q3. Ready state means a process has:

A. All required resources except memory

B. All required resources except CPU

C. All required resources except I/O devices

D. None of the above

Q4.Default file system of linux:

A. Ext3

B. NTFS

C. CDFS

D. RAID

Q5. Default file system of Windows 2003:

A. Ext3

B. NTFS

C. CDFS

D. RAID

Q6.Which of the following is a non-preemptive CPU scheduling policy:

A. Shortest job first

B. First come first served

C. Shortest remaining time

D. Both A & B

Q7. Banker's algorithm is used for deadlock:

A. Avoidance

B. Detection

C. Prevention

D. Banking transaction on computer

Q8.Which of the following is a place replacement strategy?

A. FIFO

B. Second Chance

C. Clock Page

D. None of the above

Q9. In paging, can the total address spaceexceed the size of the physical memory?

A. Yes

B. No

C. Sometimes

D. Depends on process

Q10. Interleaved execution of more than one programs at a time is known as:

A. Multiprogramming

B. Multitasking

C. Multiprocessing

D. GUI

CHAPTER-8

Information Management

Q.1 Explain the concept of Low Level Files, Structured Files, Database Management System and Multimedia Storage.

Ans.: Low Level Files : A **File** is a named collection of related information that is stored on the secondary storage. The logical extension of storage blocks starts at byte stream files. Each byte in the stream is addressable and has an index. These indexes are used to make reference to byte in the file.

Structured files : The Structured Files are represented on the storage media as a collection of blocks.

Database Management System : In Database Environment, common data are available and used by multiple users. The Software that is used to manage the data base is called as **DBMS.**

Multimedia Storage : The Multimedia Documents are highly Structured Files, which contain information in the form of *characters, numbers, graphics, pictures, audio etc.*

Q.2 Define the Strategies of Contiguous, Linked and Indexed Allocation in File System.

Ans.: (i) **Contiguous Allocation :** The Contiguous Allocation method requires each file to occupy a set of contiguous blocks on the disk. Disk addresses define a linear ordering on the disk. The directory entry for each file indicates the

address of the starting block and the length of the area allocated for this file. Accessing a file that has been allocated contiguously is easy.

(ii) **Linked Allocation :** With Link Allocation, each file is a linked list of disk blocks; the disk blocks may be scattered anywhere on the disk and any free block on the free-space list can be used to satisfy a request ,there is no need to declare the size of a file when that file is created. A file can continue to grow as long as there are free blocks.

(iii) **Indexed Allocation :** The problem with **Linked Allocation** is that, the pointers to the blocks are scattered with the blocks themselves all over the disk and need to be retrieved in order, while in **Indexed Allocation** all the pointers bring together into one location: the index block. These types of allocations support direct access.

Q.3 What is the use of Directories?

Ans.: Directories : The Directories are treated as files which keep track of all other files. The Directory contain information about the files such as location and owner of the file etc. the Directory is itself a file, owned by the Operating System and accessible by various file management routines.

Q.4 Explain the various types of Directory Systems.

Ans- **Type of directories** : Directories can be organized in following ways :

(1) **Single-Level Directory :** In a Single-Level Directory System, all the files are placed in one directory. This is a very common **Single-User OS**. Even with a single-user, as the number of files increases, it becomes difficult to remember the names of all the files in order to create only files with unique names.

(2) **Two-Level Directory :** In the Two-Level Directory System, the system maintains a master block that has one entry for each user. This master block contains the addresses of the directory of the users.

(3) **Tree-Structured Directories :** In the Tree-Structured Directories, the **Directories** themselves are **Files.** This leads to the possibility of having sub-directories that can contain files and sub-subdirectories.

(i) **Acyclic-Graph Directories :** The Acyclic Directory Structure is an **extension of the Tree-Structured Directory Structure.** In the Acyclic Structure, a directory or file under directory can be owned by several users. Thus an **Acyclic Graph Structure** allows directories to have shared subdirectories and files.

(ii) **General Graph Directory :** One problem with using an Acyclic Graph Structure is ensuring that there is no cycle. However to avoid traversing shared sectors of an Acyclic Graph twice, we can allow cycles to exist. If cycles are allowed to exist in the directory, we generally, want to avoid searching any component twice, for reason of correctness and performance.

Q.5 Write the methods of sharing information across the network.

Ans.: Sharing Information Across the Network : The most common application of network is to allow process on one machine to access main memory or secondary memory on another machine. This facility needs to be provided by Operating System. To read from/write to primary memory and secondary memory of a remote machine connected in a network we can use **Implicit File Copying System.** Similarly, information can be shared among machines by explicitly copying files from one machine to another machine across the network.

Q.6 Write a note on Remote Disk System.

Ans.: Remote Disk System : In the past the hard disks were costly and were not comfortable with the office environment and thus the requirement of diskless machine was generated which could be connected to the server with high capacity of hard disk. Using **Disk Management**, you can remotely manage disks

on another computer in your network. To manage disks that are connected to remote computers, you must be a member of the **Backup Operators Group or Administrators Group** on both the **Local and Remote Computers.** The types of volumes and disks you can create depend on the Operating System **running on the Remote Computer**, not the Local Computer.

Q.7 Write a note on Remote File System.

Ans.: Remote File System : **To reduce networks delay and provide same interface** to the application program as the Local File System, we can use Remote File System in place of Remote Disk System. The Remote File System is divided in to **Client Part** and **Server Part**. The Client Part contains the details related to operations required to communicate with Server Part.

Q.8 What do you mean by File Level Caching?

Ans.: File Level Caching : This scheme allows automatic copying of the entire files from servers to client and once the operation at client is over, the file is closed and then the file is returned back to the server.

Q.9 Define various Security Threats in context of Computer System.

Ans.: Security Threats : The major Security Threats perceived by userd and providers of Computer-Based Systems are-

(i) Unauthorized disclosure of information.

(ii) Unauthorized alteration or destruction of information.

(iii) Unauthorized use of service.

(iv) Denial of service to legitimate users.

Q.10 Write the difference between Viruses and Worms.

Ans.: Viruses and Worms : A **Computer Virus** is a code that attached itself to other programs in order to alter their behavior, in an harmful way. Viruses normally

cause direct harm to the system. While a **Computer Worm** is a program written in such a way that is spread to other computers over a network and it also consumed the network resources to a very large extent. But it does not harm any other computer program or data.

Q.11 Define various Security Design Principles.

Ans.: Security Design Principles : The General Design Principles for Protection Mechanisms are :

(i) Public Design
(ii) Least Privilege
(iii) Explicit Demand
(iv) Continuous Verification
(v) Simple Design
(vi) User Acceptance
(vii) Multiple Conditions

Q.12 What is the goal of Authentication?

Ans.: Authentication : Authentication is a process of verifying whether a person is a legitimate user or not. The **primary goal of Authentication** is to allow access to legitimate system users and to deny access to unauthorized parties. The password is the most commonly used authentication scheme which is also easy to implement.

Q.13 Define various Protection Mechanisms used for Protecting Files.

Ans.: Protection Mechanisms : There are a number of mechanisms that are employed to protect the system resources. For various objects, the Operating System allows different Access Rights for different subjects. An **Access Control Matrix (ACM)** has to be stored by Operating Systems in order to decide to which user to grant what access rights for which file. Basically there are three methods used for **storing the ACM :**

(i) Access Control List
(ii) Capability List
(iii) Combined Scheme

Q.14 What do you mean by Encryption?

Ans.: Encryption : In technical terms, the process of encoding messages is called as **Encryption.** In it the original text is called as **Plain Text** but when it is encrypted, it is called **Cipher Text.** The recipient understands the meaning and decodes the message to extract to correct meaning out of it. This process is called **Decryption.**

□ □ □

Multiple Choice Question

Q1. SIGNAL and WAIT operation are related to
- A. Multiprogramming
- **B. Semaphores**
- C. Pre-emptive scheduling of processes
- D. None of the above

Q2. Messages are very much required for
- A. synchronization
- **B. inter process communication**
- C. both (a) and (b)
- D. None

Q3. IPC stands for:
- **A. Inter- Process communication**
- B. Intra-Process communication
- C. In-Program cooperation
- D. None

Q4. Mutual Exclusion problem occurs between
- A. two disjoint processes that do not interact
- **B. processes that share resources**
- C. processes that do not use the same resource
- D. None

Q5. Which of the following is not a direct function of operating system
- A. I/O operation
- B. Memory management
- C. Resource management
- D. **DBMS**

Q6. Which of the following condition is not responsible for a deadlock to occur?
- A. Mutual Exclusion
- B. Hold and Wait
- C. No-Preemption
- **D. Semaphore**

Q7. A situation where two or more processes get into a state whereby each is holding a resource while other is requesting

A. Page Fault
B. Debugging
C. Deadlock
D. I/O management

Q8.If bankers algorithem is to deadlock,Paging is to:

A. Memory management
B. Scheduling
C. Threads
D. None of the above

Q9. In UNIX,the command to terminate execution of a program is:

A. Kill
B. Fork
C. Stop
D. End

Q10. An operating system works as:

A. An extended machine
B. A resource manager
C. A & b both
D. None of the above

CHAPTER-9

Distributed Systems

Q.1 Define Distributed Systems.

Ans.: Distributed Systems : Distributed Computing deals with hardware and software systems containing more than one processing element, storage element, concurrent processes, or multiple programs, running under a loosely or tightly controlled system. In distributed computing a program is split up into parts that run simultaneously on multiple computers communicating over a network. Distributed computing is a form of parallel computing.

Q.2 What are the advantages of Distributed Systems?

Ans.: Advantages of Distributed Systems : The main advantages of Distributed Systems are :

- Resource Sharing (Data and Hardware)
- Communication
- Performance
- Economies of Scale
- Reliability
- Incremental Growth

Q.3 Explain the Distributed Process Management in brief.

Ans.: Distributed Process Management : In Distributed Computing, the network provides an opportunity for the computation to be divided into logical units, so that each logical unit operates independently and simultaneously to achieve higher degree of computation in the computers in the networks.

To support Distributed Computation, following activities in process management are required :

- Creation/Destruction
- Scheduling
- Synchronization
- Deadlock management

Q.4 Define Message Passing System.

Ans.: Message Passing System : In Computer Science, message passing is a form of communication used in parallel computing, object-oriented programming, and inter-process communication. Communication is made by the sending of messages to recipients. The most common model used for distributed message passing is referred to as client-server model. A client process requires some service and sends a message containing a request for service to a server process. The server process honors the request and sends a reply.

Q.5 Explain RPC.

Ans.: RPC : Many Distributed Systems have been based on explicit message exchange between processes. When a process on machine A calls a procedure on machine B, the calling process on A is suspended, and execution of the called procedure takes place on B. Information can be transported from the caller to the callee in the parameters and can come back in the procedure result. No message passing at all is visible to the programmer. This method is known as **Remote Procedure Call**, or often just **RPC**.

Q.6 How the Memory is Managed in Distributed Environment?

Ans.: Memory Management in Distributed Environment : There was an abstract model of memory management in Distributed Systems. With this model we can

express communication, allocation and garbage collection, but otherwise hide many of the lower-level details of an actual implementation. In Distributed Memory Management, OS support for management of remote disk and remote files is also required. The distributed memory can be implemented using either of the architecture i.e.- by Multi-Computer or Network of machine.

Q.7 Explain the Security Requirements of Distributed Systems.

Ans.: Security Requirements of Distributed Systems : In Distributed Systems, Network Services are also involved. Hence the major **Security Threats** are :

(1) Leakage of the contents of a message between two processes.

(2) Modification of the contents of a message.

(3) Impersonation of a user by an unauthorized user.

□ □ □

Multiple choice Question

Q1. The operating system which the IBM –PC uses:

E. **CP/M**
F. MS-DOS
G. UNIX
H. AT-DOS

Q2.Most operating system are designed to run with a specific:

E. Type of processor
F. Manufacturer's printer
G. Brand of computer
H. Style of keyboard

Q3.A technique that can be used when a very long program exceeds the storages capacity of memory is called:

E. Windowing
F. Time sharing
G. Linkage editing
H. Virtual memory

Q4.An operating system designed for uase on both PC's at home andon serversin business is:

E. Windows XP
F. Windows ME
G. Windows NT
H. Windows CE

Q5. The address, which CPU ,generates is called as:

E. Physical address
F. Actual address
G. Logical address
H. None of the above

Q6.Conditions for deadlock are:

A. Mutual exclusion and partial allocation
B. Non-preemption and circular wait
C. Both A & B
D. None of the above

Q7. DMA stands for:

A. Direct memory access
B. Direct memory assigned
C. Digital memory access
D. All of the above

Q8. In UNIX dead nlock is handled considering:

A. Ignore the problem
B. By resource preemption
C. Solve the problem
D. none of the above

Q9. The two important characteristics of I/o devices are:

A. Asynchronous operation
B. Speed gap

C. A and B both

D. None of the above

Q10. The addressing scheme used for I/O devices is:

A. Memory mapped I/O

B. I/O mapped I/O

C. A and B both

D. None of the above

BACHELOR OF COMPUTER APPLICATIONS
(Part-I) EXAMINATION
(Faculty of Science)
(Three – Year Scheme of 10+2+3 Pattern)
PAPER 117
OPERATING SYSTEM FUNDAMETNALS

OBJECTIVE PART- I
Year - 2011

Time allowed : One Hour **Maximum Marks : 20**

The question paper contains 40 multiple choice questions with four choices and student will have to pick the correct one (each carrying ½ mark).

1. All process control computers are dedicated to
   (a) Complex applications (b) Multiple applications
   (c) Simple applications (d) Single applications ( )

2. In time sharing system the basic aim is:
   (a) To allow users to interact with the computer system at the same time
   (b) To allow many users to interact using punched cards
   (c) To share memory among the users
   (d) Multiprocessing system ( )

3. Which of the following is true?
   (a) MS-DOS does not support multiprogramming
   (b) MS-DOS supports multiprogramming to some extent
   (c) MS-DOS supports multiprogramming
   (d) None of the above ( )

4. In distributed system:
   (a) Each system has separate clock
   (b) Each system shares memory and clock
   (c) Each system has separate memory and clock
   (d) All of the above ( )

5. The ……is small program that runs when you first start the computer.
   (a) FAT (b) Folder
   (c) Boot Record (d) Root Directory ( )

6. CPU bound job will have more:
   (a) IO burst (b) CPU burst
   (c) Both (a) and (b) (d) Neither (a) nor (b) ( )

7. Long term scheduler is also called as:
   (a) Memory schedular
   (b) CPU schedulear
   (c) Job schedular
   (d) None of the above ( )

8. Round-Robin scheduling is perfect in……operating system.
   (a) Time sharing
   (b) Multiprogramming
   (c) Batch processing
   (d) All of the above ( )

9. Which of the following scheduling algorithms in general gives minimum waiting time?
   (a) FCFS (b) SJF
   (c) Round-Robin (d) Priority ( )

10. The address which CPU generates is called:
    (a) Physical address (b) Actual address
    (c) Logical address (d) Primary address ( )

11. An API stands for:
    (a) Application Program Interfaces
    (b) Application Programming Interconnect
    (c) Application Processing Interface
    (d) Application Processing Interrupt ( )

12. Default file system of Windows 2003 is:
    (a) Ext 3 (b) NTFS
    (c) CDFS (d) RAID ( )

13. The speed of I/O device is:
    (a) More than CPU

(b) Show than CPU
(c) Equal to CPU
(d) None of the above ( )

14. Synchronous transfer is preferred when:
(a) I/O devices and CPU speed matches
(b) I/O devices and very show than CPU
(c) I/O devices and very fast than CPU
(d) None of the above ( )

15. CPU resource management is known as:
(a) Scheduling
(b) I/O management
(c) Swapping
(d) None of the above ( )

16. Garbage collector:
(a) Is critical for efficient virtual memory system
(b) Prevents fragmentation from occurring
(c) Is most useful with fixed partitions
(d) Collects fragmented areas of memory ( )

17. Virtual memory provides……of physical memory.
(a) Synchronization (b) Abstraction
(c) Paging (d) Debugging ( )

18. The process of mapping a diskette is called:
(a) Downloading (b) Uploading
(c) Booting (d) Formatting ( )

19. Semaphores are used to solve the problem of:
(a) Race condition
(b) Process synchronization
(c) Mutual exclusion
(d) None of the above ( )

20. The part of an operating system which permanently resides in main memory is:
(a) Kernel
(b) Job scheduling module
(c) Translator

(d) None of the above ( )

21. Part of the program or a process where a shared resource is accessed, is called:
(a) Race condition (b) Segment offset
(c) Critical section (d) Mutual code ( )

22. In UNIX deadlock is handled considering:
(a) Ignore the problem
(b) By resource pre-emption
(c) Solve the problem
(d) None of the above ( )

23. Magnetic drum is a:
(a) Sequential access storage device
(b) Randomly access storage device
(c) Both (a) and (b) are true
(d) Neither (a) nor (b) is true ( )

24. Disk scheduling involves deciding:
(a) Which disk should be accessed next?
(b) The order in which disk access requests must be serviced
(c) The physical location where files should be accessed in the disk
(d) None of the above ( )

25. Buffering is a technique used in office management:
(a) to bridge the gap between show I/O devices and fast processor
(b) to bridge the gap between cost of I/O devices and processor
(c) to bridge the gap between I/O
(d) none of the above ( )

26. Asynchronous data transfer is used when:
(a) I/O devices and CPU speed matches
(b) I/O devices are very show than CPU
(c) I/O devices are very fast than CPU
(d) None of the above ( )

27. In first fit memory allocation scheme, the available space is:
(a) Stored by location (b) Stored by size
(c) Stored by time (d) Stored by cost ( )

28. In real time operating system, which of the following is the most suitable scheduling scheme:
    (a) Round-Robin (b) Fist Come First Served
    (c) Pre-emptive scheduling (d) Random scheduling ( )

29. The memory partition algorithm shall consider:
    (a) Fast speed
    (b) Simplicity
    (c) Less fragmentation
    (d) All of the above ( )

30. The fist-fit and worst-fit algorithm can be used for:
    (a) Contiguous allocation of memory
    (b) Linked allocation of memory
    (c) Indexed allocation of memory
    (d) All of the above ( )

31. Fork (Label) instruction procedures are:
    (a) Two concurrent executions in the program
    (b) Two non-concurrent executions in the program
    (c) Both (a) and (b) are true
    (d) Neither (a) nor (b) is true ( )

32. Command interpreter is a:
    (a) System program for interface between user and operating system
    (b) System program for interface between user and hardware
    (c) Application program for interface between user and hardware
    (d) None of the above ( )

33. Data structure which keeps details related with state of the process is called as:
    (a) Process abstractor (b) Process descriptor
    (c) Process status (d) Programme descriptor ( )

34. Which of the following is well suited for batch processing?
    (a) Process control (b) Preparing mailing addresses
    (c) Preparing pay slips of employees (d) Video game control ( )

35. A kilobyte corresponds to:
    (a) 1024 bytes (b) 1000 bytes
    (c) 1000 bits (d) 1024 bits ( )

36. Some computer systems support dual mode operation-the user mode and the supervisor or monitor mode. These refer to the modes:
    (a) By which user programs handle their data
    (b) By which the operating system executes user programs
    (c) In which the processor and the associated hardware operate
    (d) Of memory access ( )

37. Example of I/O bound job is:
    (a) Printing of pay slips of a large organisation
    (b) Arithmetic calculations
    (c) Simulation program
    (d) All of the above ( )

38. Which scheduler has the highest frequency?
    (a) Short term scheduler
    (b) Long term scheduler
    (c) Medium term scheduler
    (d) All the above have same ( )

39. Memories can be arranged capacity wise in increasing order as follows:
    (a) Optical disk, magnetic disk, main memory, cache
    (b) Magnetic disk, main memory, cache, optical disk.
    (c) Main memory, cache, optical disk, magnetic disk
    (d) Cache, main memory, magnetic disk, optical disk ( )

40. The incompatibility between two I/O devices arise because of difference is:
    (a) Data format
    (b) Timing for data transfer
    (c) Electrical character of two devices
    (d) All of the above ( )

Answer Key

1. ( )	2. ( )	3. ( )	4. ( )	5. ( )	6. ( )	7. ( )	8. ( )	9. ( )	10. ( )
11. ( )	12. ( )	13. ( )	14. ( )	15. ( )	16. ( )	17. ( )	18. ( )	19. ( )	20. ( )
21. ( )	22. ( )	23. ( )	24. ( )	25. ( )	26. ( )	27. ( )	28. ( )	29. ( )	30. ( )
31. ( )	32. ( )	33. ( )	34. ( )	35. ( )	36. ( )	37. ( )	38. ( )	39. ( )	40. ( )

DESCRIPTIVE PART-II

Year- 2011

Time allowed : 2 Hours **Maximum Marks : 30**

Attempt any four questions out of the six. All questions carry 7½ marks each.

Q.1 (a) 'Operating system works as a resource manager.' Justify the above statement.

(b) Explain the various factors one shall keep in mind while designing the operating system.

Q.2 Given the following jobs to execute with one processor:

Process	Burst Time	Priority
P_1	70	2
P_2	20	4
P_3	10	3
P_4	15	5
P_5	40	1

The jobs are assumed to arrive at the same time. Using priority scheduling execute the following :

(i) Create a Gantt chart illustrating the execution of these processes.

(ii) What is the turnaround time for process?

(iii) What is the average waiting time for the process?

(b) What are the major criteria for selection of best algorithm for CPU utilization?

Q.3 (a) What is time sharing? How is it achieved? Explain.

OPERATING SYSTEM FUNDAMETNALS

OBJECTIVE PART- I

Year - 2010

Time allowed : One Hour **Maximum Marks : 20**

The question paper contains 40 multiple choice questions with four choices and student will have to pick the correct one (each carrying ½ mark).

1. Operating system is :
   (a) hardware
   (b) software
   (c) application program
   (d) none of the above ( )

2. Multitasking supports:
   (a) time sharing
   (b) multiprogramming
   (c) multiple process
   (d) All of the above ( )

3. If Banker's algorithm is to deadlock, then paging is to:
   (a) memory management
   (b) scheduling
   (c) threads
   (d) none of the above ( )

4. Cache memory :
   (a) has greater capacity then RAM
   (b) is faster to access then CPU register
   (c) is permanent storage
   (d) is faster to access than DRAM ( )

5. Which of the following is true?
   (a) Overlays are used to increase the size of physical memory
   (b) Overlays are used to increased the logical address space
   (c) When overlays are used, the size of a process is not limited to the size of physical memory

(d) Overlays are used whenever the physical address spaces is smaller than the logical address space ( )

6. In real time operating system, which of the following is the most suitable scheduling scheme?
   (a) round robin (b) first come first served
   (c) pre emptive scheduling (d) random scheduling ( )

7. Page means:
   (a) fixed size blocks
   (b) variable size blocks
   (c) physical memory
   (d) none of the above ( )

8. The logical address and physical address differ during:
   (a) load time
   (b) compile time
   (c) executive time
   (d) all of the above ( )

9. Which of the following operating system is available free over the internet?
   (a) MS DOS (b) LINUX
   (c) Windows (d) Windows 2000 ( )

10. Which of the following is also known as a "light weight process"?
    (a) Function (b) Application module
    (c) Kernel (d) Thread ( )

11. In UNIX, the command to terminate execution of a program is:
    (a) kill (b) fork
    (c) stop (d) thread ( )

12. In index sequential file:
    (a) Unique key is required
    (b) Processing is relatively slow
    (c) Periodic assessment is required
    (d) All of the above ( )

13. Multi media means an application which involves:
    (a) audio

(b) video
(c) text
(d) all of the above ( )

14. Fire wall is a security mechanism between:
(a) enterprise network and the internet
(b) two computers
(c) computer and I/O devices
(d) all of the above ( )

15. inverted file is best suitable for:
(a) serially arranged data
(b) application requiring data on multiple keys
(c) application requiring data on single key
(d) none of the above ( )

16. Computer virus to :
(a) hard ware
(b) software
(c) firmware
(d) None of the above ( )

17. Device management scheme can be implemented using:
(a) Interrupt driven I/O
(b) Direct I/O with polling
(c) both (a) & (b)
(d) none of the above ( )

18. Disk scheduling involves deciding:
(a) Which disk should be accessed next
(b) The order in which disk access requests must be serviced
(c) The physical location where files should be accessed into the disk
(d) None of the above ( )

19. Mutual exclusion problem occurs between:
(a) Processes that share resources
(b) two disjoint processes that do not interact
(c) processes that do not use of same resources
(d) Three Column cash book ( )

20. Buffering is a technique used in a office management:
    (a) to bridge the gap between slow I/I devices and fast processor
    (b) to bridge the gap between cost of I/O devices and processor
    (c) to bridge the gap between I/O devices and processor
    (d) none of the above ( )

21. While reading or writing on disks, the time taken to move the arm to the proper cylinder is known as:
    (a) Rotational delay (b) access time
    (c) translational delay (d) seek time ( )

22. Which of the following are single user operating system?
    (a) MS DOS (b) UNIX
    (c) XENIX (d) OS/2 ( )

23. Which of the following services is not supported by the operating system?
    (a) Protection (b) Compilation
    (c) Accounting (d) I/O Operation ( )

24. PCB has bare minimum value in:
    (a) New State (b) Terminated State
    (c) Ready state (d) Wait state ( )

25. Long-term scheduler is also called us:
    (a) Memory scheduler
    (b) CPU scheduler
    (c) Job scheduler
    (d) None of the above ( )

26. The scheduler shall aim to:
    (a) Maximize CPU utilization (b) Maximize throughout
    (c) Minimize turnaround time (d) All of the none ( )

27. Dijkstra proposed the tool for synchronization :
    (a) FORK (b) JOIN
    (c) Semaphores (d) QUIT ( )

28. In process, synchronization is essential for:
    (a) System security
    (b) For integrity and consistency

(c) For integrity and consistency with current process recourses
(d) All of the above ( )

29. The restrictions with semaphores are:
(a) Difficult to understand
(b) difficult to implement
(c) unstructured and don't support data abstraction
(d) none of the above ( )

30. Which of the following page replacement algorithm suffers from Belady's anomaly?
(a) LRU
(b) FIFO
(c) Optimal replacement
(d) None of the above ( )

31. Wild-card specifies:
(a) provide an easy way of finding groups of related files
(b) are only used when printing the contents to files
(c) can be used when writing a file
(d) allow several when writing a file ( )

32. TCP/IP is a:
(a) Software
(b) Hardware
(c) Network
(d) None of the above ( )

33. Network addressing and transmission of data packets is rendered in:
(a) session layer
(b) transport layer
(c) network layer
(d) all of the above ( )

34. Encryption:
(a) is one common method of protecting information transmitted over unreliable linkds
(b) in crypted network information is accessed by unauthorized person
(c) both A & B
(d) none of the above ( )

35. Window NT:
    (a) is a security model based on the notion of user accounts.
    (b) creates a security access token that includes the security ID for users
    (c) operates with client server mode!
    (d) all of the above ( )

36. SIGNAL and WAIT operations are related to:
    (a) multi programming
    (b) semaphore
    (c) pre-emptive scheduling of processes
    (d) none of the above ( )

37. FSCAN is a :
    (a) Disk checking mechanism (b) Disk clearing mechanism
    (c) Disk formatting mechanism (d) Disk scheduling mechanism ( )

38. Which of the following is a type of utility to reduce the size of files to increase the amount of available disk space?
    (a) File Compression Utility (b) Troubleshooting Utility
    (c) Anti Virus Utility (d) Uninstall utility ( )

39. DBMS is preferred because of:
    (a) Consistency
    (b) Data independency
    (c) Random file system
    (d) All of the above ( )

40. Virtual Memory provides……..is physical memory.
    (a) Synchronization (b) Abstraction
    (c) Paging (d) Debugging ( )

Answer Key

1. (b)	2. (a)	3. (a)	4. (d)	5. (b)	6. (c)	7. (c)	8. (c)	9. (b)	10. (d)
11. (a)	12. (d)	13. (d)	14. (a)	15. (b)	16. (b)	17. (c)	18. (b)	19. (a)	20. (a)
21. (a)	22. (a)	23. (c)	24. (b)	25. (c)	26. (d)	27. (c)	28. (d)	29. (c)	30. (b)
31. (a)	32. (a)	33. (b)	34. (c)	35. (d)	36. (b)	37. (d)	38. (a)	39. (d)	40. (b)

DESCRIPTIVE PART-II

Year- 2010

Time allowed : 2 Hours **Maximum Marks : 30**

Attempt any four questions out of the six. All questions carry 7½ marks each.

Q.1 (a) What is real time operating system? How does it differ from generally used OS?

(b) What is distributed operating system? Where it is used? State application diagram?

Q.2 Consider the following set of processes, with the length of the CPU burst time given in milliseconds:

Process	Burst Time	Priority
P_1	10	3
P_2	1	1
P_3	2	3
P_4	1	4
P_5	5	2

The processes are assumed to have arrived in the order P_1, P_2, P_3, P_4 and P_5 all at time to:

(a) Draw Gantt Charts illustrating the execution of these processes using FCFS, SJF and round Robin Scheduling (quantum = 2)

(b) What is the turn around time for each process in above there algorithms?

(c) What is the waiting time for each process in above three algorithms?

(d) Compare with priority scheduling in terms of waiting time and turn around time.

Q.3 (a) What is the main advantage of multi programming? Why was time sharing not widespread on second generation of computers?

(b) Distinguish between a 'program' and a 'process'. Describes process life cycle with the help of a process state diagram.

Q.4 (a) What is a deadlock? Which is better 'dead-lock prevention' or 'deadlock removal'? Explain.

(b) Compare CPU scheduling and disk scheduling.

Q.5 (a) What is file management? How is it done by an operating system?

(b) Discuss the concept of 'semaphore' illustrate the application of semaphore in 'producer- consumer' or nay other problem.

Q. 6 Write short notes on any three:

(a) Swapping

(b) Security threats in distributed environment

(c) dynamic memory for data structures

(d) Remote Procedure Calls (RPC)

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OPERATING SYSTEM FUNDAMETNALS

OBJECTIVE PART- I

Year - 2009

Time allowed : One Hour **Maximum Marks : 20**

The question paper contains 40 multiple choice questions with four choices and student will have to pick the correct one (each carrying ½ mark).

1. Which is a sequential storage device?
   (a) Hard disk
   (b) Magnetic Disk
   (c) Magnetic tape
   (d) None of the above ( )

2. System in which different parts of a single program can run concurrently is:
   (a) Real time
   (b) Multitasking
   (c) Multithreading
   (d) None of the above ( )

3. Which of the following is not an operating system?
   (a) WINDOWS (b) PASCAL
   (c) UNIX (d) MS DOS ( )

4. TLB stands for:
   (a) Translation Look Aside Buffer (b) Terminate and Load Balance
   (c) Translation Local Bus (d) Terminate Local Buffer ( )

5. Most operating system are designed to run with a specific.
   (a) Type of processor (b) Manufacture's printer
   (c) Brand of computer (d) Style of keyboard ( )

6. Which of the following is also known as "Light Weight Process"?
   (a) Function (b) Application Module
   (c) Kernel (d) Thread ( )

7. The……..is mall program that runs when you first start the computer.

(a) FAT (b) Folder
(c) Both record (d) Root directory ( )

8. Condition for deadlocks are:
(a) Mutual exclusion are partial allocation
(b) Non preemption and circular wait
(c) Both (a) & (b)
(d) None of the above ( )

9. Dijkstra's banking algorithm in an operating system solves the problem of:
(a) Deadlock avoidance (b) Deadlock recovery
(c) Mutual exclusion (d) Context switching ( )

10. Memories can be arranged speed wise in increasing order as follows:
(a) Optical disk, magnetic, disk, main memory, cache
(b) Magnetic disk, main memory, cache, optical disk
(c) Main memory, cache, optical disk, magnetic disk
(d) Cache, optical disk, magnetic disk, main memory ( )

11. Different ways of creating and deleting process are:
(a) JOINT (b) QUIT
(c) FORK (d) All of the none ( )

12. The two important characteristics of I/O devices are:
(a) Asynchronous operations
(b) Speed gap
(c) Both (a) and (b)
(d) None of the above ( )

13. Overlay is:
(a) A part of an operating system
(b) A single memory location
(c) A single contiguous memory that was used in olden days for running large program
(d) Overloading the system with many user files ( )

14. An assembly language program is typically:
(a) Non protable
(b) Shorter than equivalent HLL program

(c) Harder to read than machine code program
(d) Slower to execute than complied HLL program ( )

15. A kilobyte corresponds to:
(a) 2^8 Byte (b) 2^9 Byte
(c) 2^{10} Byte (d) 2^{12} Byte ( )

16. The default file system for windows 2000 server family is:
(a) EXT3 (b) NTFS
(c) CDFS (d) FAT32 ( )

17. Thrashing is related to:
(a) Cache memory (b) Main memory
(c) Secondary memory (d) Virtual memory ( )

18. Remote procedure call (RPC) is:
(a) Communication is centralized system
(b) Communication is distributed system
(c) Both (a) and (b)
(d) None of the above ( )

19. Networking addressing and transmission of data packets is rendered in:
(a) Network layer
(b) Transport layer
(c) Session layer
(d) All of the above ( )

20. Real time operating system are mainly used in:
(a) EDP processing (b) Industry
(c) Office automation (d) Day to Day operations ( )

21. SIGNAL and WAIT operations are related to:
(a) Multi programming
(b) Semaphore
(c) Preemptive scheduling of process
(d) None of the above ( )

22. CPU resource management is known as:
(a) Scheduling

(b) I/O management
(c) Swapping
(d) None of the above ( )

23. Which of the following scheduler is well for a time-shared operating system?
(a) Shortest job first (b) Round robin
(c) First come first served (d) Elevator ( )

24. The minimum number of bits required to represent 34 is:
(a) 8 (b) 5
(c) 6 (d) 7 ( )

25. Swapping is also called us:
(a) Roll out technique
(b) Roll in technique
(c) Roll out roll in technique
(d) None of the above ( )

26. A technique that can be use when a very log on program exceeds the storage capacity of memory is called:
(a) Windowing (b) Time Sharing
(c) Linkage editing (d) Virtual memory ( )

27. The typical RAM capacity of a PC is of the order of:
(a) 64 KB (b) 64 MB
(c) 16 GB (d) 1 TB ( )

28. RAID is an acronym of:
(a) Redundant array of interdependent disks
(b) Redundant array of infected disks
(c) Redundant array of internal disks
(d) Redundant array of independent disks ( )

29. In semaphore implement, V (for Verhagen) means:
(a) Increment
(b) Test
(c) Verhagen is not related to semaphore concept
(d) None of the above ( )

30. TSL (Test set lack) instruction to used to:

(a) Implement mutual exclusion between two processes
(b) Avoid deadlock
(c) Test the availability of page frame and lock it
(d) None of the above ( )

31. OSI model has got:
(a) 4 layers (b) 6 layers
(c) 7 layers (d) 10 layers ( )

32. OSI model has got:
(a) Direct memory assigned
(b) Digital memory access
(c) Direct memory access
(d) None of the above ( )

33. This type of boot occurs when the computer is already on, and you restart it without turning off the power:
(a) Generic boot (b) Live boot
(c) Warm boot (d) Cold boot ( )

34. A file needed for updating a master file as a:
(a) Sequential file
(b) Random file
(c) Transaction file
(d) None of the above ( )

35. The operating system which the IBM PC uses:
(a) CP/M (b) MS/DOS
(c) UNIX (d) AT-DOS ( )

36. In paging can the total address space exceed the size of the physical memory?
(a) Yes (b) No
(c) Sometimes (d) Depends on process ( )

37. Netware is a
(a) Protocol (b) Route
(c) Network operating system (d) None of the above ( )

38. Disadvantage is generally originated by:
(a) Complex software

(b) Costly networking
(c) Complex security
(d) All of the above ( )

39. Interrupt is generally originated by:
(a) Hardware problem (b) software problem
(c) Both A & B (d) the user ( )

40. PCB stands for:
(a) Program Control Block (b) Process Control Bus
(c) Program control bus (d) Process Control Block ( )

Answer Key

1. (c)	2. (c)	3. (b)	4. (a)	5. (a)	6. (d)	7. (c)	8. (c)	9. (a)	10. (a)
11. (d)	12. (c)	13. (c)	14. (b)	15. (c)	16. (d)	17. (d)	18. (b)	19. (b)	20. (b)
21. (b)	22. (a)	23. (b)	24. (c)	25. (c)	26. (d)	27. (b)	28. (d)	29. (a)	30. (a)
31. (c)	32. (c)	33. (c)	34. (c)	35. (c)	36. (a)	37. (c)	38. (d)	39. (c)	40. (d)

DESCRIPTIVE PART - II

Year 2009

Time allowed : 2 Hours **Maximum Marks : 30**

Attempt any four questions out of the six. All questions carry 7½ marks each.

Q.1 (a) Draw the logic circuit of 8 x 1 multiplexer with enable input and explain its operation with the help of truth table.

(b) Explain the execution cycle within CPU.

Q.2 (a) What is an operating system? Explain its function.

(b) What are the main differences between operating system for mainframe computer and personal computer?

Q.3 (a) Explain memory management and describe various methods of memory management.

(b) Discuss the concept of 'semaphore'. What are the usage and drawbacks semaphore?

Q.4 Write short notes on any three:

(a) Remote Procedure Calls (RPC)

(b) Inter process communication

(c) Round Robin scheduling

(d) Distribution processing system

Q.5 What is resource allocation graph? Describe its various entities. Also draw separate resource. Allocation graphs showing a deadlock and a cycle but no deadlock.

Q.6 Differentiate any three:

(a) Program and process

(b) Memory mapped I/G and Direct memory access

(c) Linked allocation and indexed allocation of disk block

(d) Real time system and Embedded system

OPERATING SYSTEM FUNDAMETNALS

OBJECTIVE PART- I

Year - 2008

Time allowed : One Hour **Maximum Marks : 20**

The question paper contains 40 multiple choice questions with four choices and student will have to pick the correct one (each carrying ½ mark).

1. Distributed system should:
   (a) Meet prescribed time constraints
   (b) Aim better resource sharing
   (c) Aim better system utilization
   (d) Aim low system overhead ( )

2. Operating system is required to manage:
   (a) Hardware
   (b) Memory
   (c) Various resources
   (d) All of the above ( )

3. In real time operating system which of the following in the most suitable scheduling scheme:
   (a) Round Robin (b) First Come First Served
   (c) Preemptive (d) Random Scheduling ( )

4. Dijkstra proposed the tool for synchronization:
   (a) FORK
   (b) JOIN
   (c) Semaphores
   (d) None of the above ( )

5. Interrupt is generally originated by:
   (a) Hardware Problem (b) Software Problem
   (c) Both (a) and (b) (d) The User ( )

6. Device driver is:

(a) Hardware
(b) Software
(c) Both A and B
(d) None of the above ( )

7. CPU resource management is known is:
(a) Scheduling
(b) I/O management
(c) Swapping
(d) None of the above ( )

8. A set of adjacent tracks on a magnetic disk is:
(a) Cluster
(b) Surface
(c) Band
(d) None of the above ( )

9. LAN speeds are measured in:
(a) bps (b) kbps
(c) mbps (d) gbps ( )

10. Which of the following is also known as "Light Weight Process".
(a) Thread (b) Kernel
(c) Application module (d) Function ( )

11. SIGNAL and WAIT operations are related to:
(a) Multiprogramming
(b) Semaphore
(c) Pre emptive scheduling of process
(d) None of the above ( )

12. This type of boot occurs when the computer is already on and you restart:
(a) Generic Boot (b) Live Boot
(c) Warm Boot (d) Cold Boot ( )

13. Networking addressing and transmission of data packets is rendered in:
(a) Network layer (b) Transport Layer
(c) Session layer (d) All of the year ( )

14. Which scheduler has highest frequency:

(a) Short term scheduler
(b) Medium term scheduler
(c) Long term scheduler
(d) All above has same ( )

15. Different ways of creating and deleting process are:
(a) FORM
(b) QUIT
(c) JOIN
(d) All of the above ( )

16. The typical RAM capacity of a PC is of the order of:
(a) 64 KB (b) 64MB
(c) 16 GB (d) 1 TB ( )

17. The part of an operating system which permanently resides in main memory:
(a) Kernel
(b) Job scheduling module
(c) Translator
(d) None of the above ( )

18. Netware is:
(a) Route
(b) Network operating system
(c) Protocol
(d) None of the above ( )

19. Round Robin scheduling is perfect in:
(a) Batch processing
(b) Time Sharing
(c) Multiprogramming
(d) All of the above ( )

20. Long term scheduler is also called:
(a) Job scheduler
(b) Memory scheduler
(c) CPU scheduler
(d) None of the above ( )

21. Swapping is also called as:

(a) Roll in technique
(b) Roll out technique
(c) Roll out roll in technique
(d) All of the above ( )

22. Bleady's Anomaly is relate to
(a) Disk scheduling
(b) Banker's algorithm
(c) Segmentation
(d) None of the above ( )

23. 'Sleeping Barber' is a classic problem of:
(a) Inter process communication
(b) inter process synchronization
(c) Intra process communication
(d) None of the above ( )

24. A computer can not boot if it does not have:
(a) Compiler (b) Assembler
(c) Loader (d) Operating System ( )

25. In the batch processing system the tasks are submitted in:
(a) One by one
(b) Similar tasks in batches
(c) Different tasks in batches
(d) All of the above ( )

26. Which of the following scheduling algorithms in general gives minimum average waiting time:
(a) Round Robin (b) STF
(c) FCFS (d) Priority ( )

27. Operating system does not support the following services:
(a) Device management (b) Memory Management
(c) I/O operation (d) DBMS ( )

28. Which of the following is true?
(a) MS-DOS does not support multiprogramming
(b) MS-DOS supports multiprogramming to some extent
(c) MS-DOS supports multiprogramming

(d) None of the above ( )

29. Remote procedure call (RPC) is:
(a) Communication in centralized system
(b) Communication in distributed system
(c) Both A & B
(d) None of the above ( )

30. A……is powerful computer, which acts as a shared storage resources:
(a) Client (b) Server
(c) Node (d) Inode ( )

31. The process of mapping a diskette is called:
(a) Downloading (b) Up-loading
(c) Booting (d) Formatting ( )

32. Trojan-horse programs:
(a) Are legitimate program that allow unauthorized access
(b) Are hacker programs that do not show up on system
(c) Really do not usually work
(d) Usually are immediately discovered ( )

33. A file is:
(a) An abstract type
(b) Logical storage unit
(c) File is usually volatile
(d) All of the above ( )

34. Which types of file organization are supported by magnetic tape?
(a) Random files
(b) Contiguous sequential file
(c) Indexed sequential file
(d) All of the above ( )

35. Semaphores are used to solve the problem of:
(a) Race condition
(b) Process synchronization
(c) Mutual exclusion
(d) None of the above ( )

36. The most common system security method is:
(a) Password
(b) Key card system
(c) Mantrap
(d) None of the above ( )

37. Mutual exclusion problem occur between:
(a) Two disjoint processes that do not interact
(b) Processes that do not use the same resource
(c) Processes that do not use the same resource
(d) None of the above ( )

38. The garbage collector:
(a) Is critical for efficient virtual memory system
(b) Prevents fragmentation from occurring
(c) Is mostly used with fixed partitions
(d) Collects fragmented areas of memory ( )

39. Page fault occur when:
(a) The page is corrupted by application software
(b) The page is in main memory
(c) The page is not in main memory
(d) None of the above ( )

40. Virtual memory provide ……..of physical memory.
(a) Synchronization (b) Abstraction
(c) Paging (d) Debugging ( )

Answer Key

1. (b)	2. (d)	3. (c)	4. (c)	5. (c)	6. (b)	7. (a)	8. (d)	9. (c)	10. (a)
11. (b)	12. (a)	13. (a)	14. (a)	15. (d)	16. (b)	17. (a)	18. (b)	19. (b)	20. (a)
21. (c)	22. (d)	23. (b)	24. (d)	25. (b)	26. (a)	27. (d)	28. (a)	29. (b)	30. (b)
31. (a)	32. (b)	33. (a)	34. (b)	35. (d)	36. (a)	37. (b)	38. (d)	39. (c)	40. (c)

DESCRIPTIVE PART - II

Year 2008

Time allowed : 2 Hours **Maximum Marks : 30**

Attempt any four questions out of the six. All questions carry 7½ marks each.

Q.1 Differentiate any three:
- (i) Process and Thread
- (ii) Spooling and Buffering
- (iii) Paging and Segmentation
- (iv) Real time system and Embedded system

Q.2 (a) What is an operating system and how is it related to computer hardware? Describe the function also.

(b) What is the difference between kernel mode and User mode? Why is the difference important to an operating system

Q.3 (a) What is a race condition? Give an example of a race condition that could possibly occur when buying airplane tickets for two people to go on a trip together.

(b) What are schedulers? Describe three different types of schedulers.

Q.4 (a) Describe the deadlock with example. Why deadlock occur? Discuss various methods used for deadlock avoidance.

(b) Can a system be is a state that is neither deadlock nor safe? If yes, give examples?

Q.5 (a) What is the device management? Explain the various techniques used for device management?

(b) Write short note on semaphores.

Q.6 (a) What do you mean by file management.

(b) What is distribution processing? Where is it useful? What are main defects of password for multiuser system entry?

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OPERATING SYSTEM FUNDAMETNALS

OBJECTIVE PART- I

Year - 2007

Time allowed : One Hour **Maximum Marks : 20**

The question paper contains 40 multiple choice questions with four choices and student will have to pick the correct one (each carrying ½ mark).

1. Kernel is:
   (a) Memory resident port of OS
   (b) Responsible for process creation and management
   (c) Categorized as exo, micro and monolithic
   (d) All of the above ( )

2. What is a mutex?
   (a) State of a process (b) A binary semaphore
   (c) A monitor (d) Mutated instruction ( )

3. TSL (Test-set-lock) instruction is used to:
   (a) Implement mutual exclusion between two processes
   (b) to avoid deadlock
   (c) to test the availability of page frame and lock it
   (d) None of the above ( )

4. Thrashing is related to
   (a) Cache memory (b) Main memory
   (c) Secondary memory (d) Virtual memory ( )

5. Which of the following is not a system utility?
   (a) Compiler (b) Interpreter
   (c) Operating system (d) Internet explorer ( )

6. Unix is a:
   (a) Single user, single-tasking OS
   (b) Single user, multi tasking OS
   (c) Multi-user, multi-tasking OS
   (d) Multi-user, single-tasking OS ( )

7. Which of the following is a page replacement algorithm?
   (a) FIFO
   (b) LRU
   (c) Optima
   (d) All of the above ( )

8. Ready state means a process has:
   (a) All required resources except memory
   (b) All required resources except CPU
   (c) All required resources except I/o devices
   (d) All of the above ( )

9. RAID is an acronym of:
   (a) Redundant array of interdependent disks
   (b) Redundant array of infected disks
   (c) Redundant array of internal disks
   (d) Redundant array of independent disks ( )

10. FSCAN is a:
   (a) Disk checking mechanism
   (b) Disk clearing mechanism
   (c) Disk formatting mechanism
   (d) Disk scheduling mechanism ( )

11. Access matrix is a:
   (a) Model of resource/data protection
   (b) Model of domain as rows object as column
   (c) Model represented by data structures such as spare matrices
   (d) All of the above ( )

12. TLB:
   (a) Translation lood aside buffer (b) Translation local bus
   (c) Termination to load balance (d) Terminate local buffer ( )

13. Belady's Anomaly is associated to:
   (a) Page Frame (b) Virtual page
   (c) Page fault (d) Page Creation ( )

14. In round Robin CPU scheduling:

(a) Process are executed in a fixed cyclic order
(b) Process are executed in the reverse order to their arrival
(c) Process are executed in the order of their priority
(d) None of the above ( )

15. A job may be:
(a) CPU bound
(b) I/O bound
(c) Both A and B
(d) None of the above ( )

16. An API stands by:
(a) Application programming interface
(b) Application programming interconnect
(c) Application processing interface
(d) Application processing interrupt ( )

17. Static partitioning of main memory causes:
(a) External fragmentation
(b) Internal fragmentation
(c) No fragmentation
(d) None of the above ( )

18. Dynamic partitioning of main memory causes:
(a) External fragmentation
(b) Internal Fragmentation
(c) No fragmentation
(d) None of the above ( )

19. Default file system of Linux:
(a) Ext 3 (b) NTFS
(c) CDFS (d) RAID ( )

20. Default file system of windows 2003.
(a) Ext 3 (b) NTFS
(c) CDFS (d) RAID ( )

21. Which of the following is not a solution to mutual exclusion implementation?
(a) Strict alternation
(b) Paterson's solution

(c) TSL instruction
(d) None of the above ( )

22. WS clock policy algorithm:
(a) Is a scheduling mechanism
(b) Is a page replacement mechanism
(c) Is a disk scheduling mechanism
(d) None of the above ( )

23. In context of deadlock, a state in which there is at least one sequence of resource allocations to processes that does not result in a deadlock is called:
(a) Safe state (b) Unsafe state
(c) Deadlock avoidance (d) Critical state ( )

24. Which of the following is non-preemptive CPU scheduling policy?
(a) Shortest job first (b) First come first served
(c) Shortest remaining time (d) Both A and B ( )

25. Multiprogramming was not implemented :
(a) For optimal utilization of resources
(b) For higher throughout
(c) For quick response time
(d) For large storage area access ( )

26. Banker's algorithm is used for deadlock:
(a) Avoidance (b) Detection
(c) For quick response time (d) Banking transactions on computer ( )

27. In semaphore implementation, V (for verhagen) means:
(a) Increment
(b) Test
(c) Verhagen is not related to semaphore concept
(d) None of the above ( )

28. If a process is denied access to the resource indefinitely, it is called:
(a) Thrashing
(b) Competition
(c) Starvation
(d) None of the above ( )

29. Frequent page faults due to insufficient number of page frame is termed:
(a) Trashing
(b) Competition
(c) Starvation
(d) None of the above ( )

30. Part of the program or a process where a shared resource is accessed is called:
(a) Race condition (b) Segment offset
(c) Critical section (d) Mutual code ( )

31. PCB stands for:
(a) Program Control Block (b) Process code block
(c) Process Control Block (d) Process control bus ( )

32. Degree of multiprogramming means:
(a) Number of process running concurrently on the system
(b) Number of process running versus terminating per unit time
(c) Number of process executed since the system start up
(d) None of the above ( )

33. A CPU scheduling policy where the process swill runs to its completion is:
(a) Throughput (b) Real time
(c) Non-preemptive (d) Preemptive ( )

34. Which of the following is not a direct function of operating system:
(a) I/O operation (b) Memory management
(c) Resources management (d) DBMS ( )

35. Which of the following is also known as a "light weight process"?
(a) Function (b) Application Module
(c) Kernel (d) Thread ( )

36. Cache memory:
(a) Has greater capacity than RAM
(b) Is faster to access than CPU register
(c) Is permanent storage
(d) Is faster than DRAM ( )

37. LAN speeds are measured in:
(a) bps (b) kpbs

(c) mbps (d) gbps ( )

38. In UNIX, the command to terminate execution of a process is:
(a) Fork (b) Slop
(c) End (d) kill ( )

39. Which of the following is freely available over the internet?
(a) MS dos (b) Linux
(c) Windows 95 (d) Macintosh ( )

40. Most operating system are designed to run with a specific:
(a) Type of processor (b) Manufacturer's printer
(c) Brand of computer (d) Style of key board ( )

Answer Key

1. (d)	2. (b)	3. (a)	4. (d)	5. (d)	6. (c)	7. (d)	8. (b)	9. ( )	10. (d)
11. (d)	12. (a)	13. (c)	14. (a)	15. (c)	16. (a)	17. (b)	18. (a)	19. (a)	20. (b)
21. (c)	22. (b)	23. (a)	24. (d)	25. (d)	26. (a)	27. (a)	28. (c)	29. (a)	30. (c)
31. (c)	32. (c)	33. (c)	34. (d)	35. (d)	36. (d)	37. (c)	38. (d)	39. (b)	40. (a)

DESCRIPTIVE PART - II

Year 2007

Time allowed : 2 Hours **Maximum Marks : 30**

Attempt any four questions out of the six. All questions carry 7½ marks each.

Q.1 (a) Discuss the role of operating system as a Resource Manager.
(b) What are the difference between a trap and an interrupt?

Q.2 (a) What is a race condition? Why does it occur?
(b) Discuss the procedure-consumers problem (or bounded buffer problem) in context of race condition?

Q.3 What are threads? Differentiate between user level threads and kernel level threads. Under what circumstances is one type better than the other?

Q.4 What is a Resource Allocation Graph? Describe its various entities. Also draw separate Resource Allocation Graphs showing a deadlock and a cycle but no deadlock.

Q.5 Discuss the major program and system threats, in context of computer systems.

Q.6 (a) What is the difference between memory mapped I/O and Direct Memory Access?
(b) Name major files attributes and operations.

or

What is virtual memory? Discuss the tow key techniques of vitual memory implementation-paging and segmentation.

OPERATING SYSTEM FUNDAMETNALS

OBJECTIVE PART- I

Year - 2006

Time allowed : One Hour **Maximum Marks : 20**

The question paper contains 40 multiple choice questions with four choices and student will have to pick the correct one (each carrying ½ mark).

1. PCB stands for:
   (a) Program Control Block (b) Process Control Bus
   (c) Program Control Bus (d) Process Control Block ( )

2. Which of the following is not a page replacement strategy?
   (a) FIFO
   (b) Second chance
   (c) Clock page
   (d) None of the above ( )

3. While reading or writing on disks, the time taken to move the arm to the proper cylinder is known is:
   (a) Rotational delay (b) Access time
   (c) Translational delay (d) Seek time ( )

4. Which of the following is a file system?
   (a) Ext 3
   (b) FAT 32
   (c) ISO 9660
   (d) All of the above ( )

5. Dynamic partitioning of main memory results into:
   (a) External fragmentation
   (b) Internal fragmentation
   (c) Both A & B
   (d) None of the above ( )

6. Al I/O device that delivers or accepts a stream of character is called:
   (a) Block device

(b) Character device
(c) Stream device
(d) None of the above ( )

7. In paging, can the total address space exceed the size of the physical memory?
(a) Yes (b) No
(c) Sometimes (d) Depends on process ( )

8. Belady's Anomaly is related to:
(a) Disk Scheduling (b) Banker's algorithm
(c) Page Faults (d) Segmentation ( )

9. TLB stands for:
(a) Translation Look Aside Buffer (b) Terminate and Load Balance
(c) Terminate And Load Bus (D) Terminate Local Buffer ( )

10. "Degree of multiprogramming" means:
(a) Number of processes running concurrently on the system
(b) Number of process running versus terminating in a second
(c) Number of process executed since the system start up
(d) None of the above ( )

11. "Sleeping barber" is a classic problem of:
(a) Inter process communication
(b) Inter process synchronization
(c) Intra process communication
(d) None of the above ( )

12. Which of the following is not an operating system:
(a) Windows 98 (b) Windows 95
(c) Windows 3.1 (d) Windows 2000 ( )

13. SJF is a:
(a) CPU scheduling policy
(b) Memory Management Scheme
(c) Resources Management/Allotment Strategy
(d) None of the above ( )

14. SIGNAL and WAIT operations are related to:
(a) Multiprogramming

(b) Semaphore
(c) Preemptive scheduling of processes
(d) None of the above ( )

15. The ability of lead and execute a given program into an arbitrary place in memory is:
(a) Dynamic Execution of Program
(b) Program Relocatability
(c) Segmented Execution of Program
(d) None of the above ( )

16. Interleaved execution of more than one programs at a time is known is:
(a) Multiprogramming (b) Multitasking
(c) Multiprocessing (d) Graphical user interface ( )

17. A CPU scheduling strategy where the process will run to its completion is :
(a) Throughout (b) Real time
(c) Non-preemptive (d) Preemptive ( )

18. Which of the following is not a direct function of an operating system;
(a) I/O operation (b) Memory management
(c) Resources management (d) DBMS ( )

19. Which of the following is also known as a "lightweight process"
(a) Function (b) Application Module
(c) Kernel (d) Thread ( )

20. A GUI is a :
(a) Hardware (b) Language interpreter
(c) Kernel (d) An operating system ( )

21. A kilo byte corresponds is:
(a) 1024 (b) 1000 bytes
(c) 1000 bits (d) 1024 bytes ( )

22. Cache memory:
(a) Has greater capacity than RAM
(b) Is faster access than CPU register
(c) Is permanent storage
(d) Is faster to access than DRAM ( )

23. The typical RAM capacity of a PC is of the order of:
(a) 64 KB (b) 64 MB
(c) 16 GB (d) 1 TB ( )

24. LAN speeds are measured in:
(a) bps (b) kbps
(c) mbps (d) gbps ( )

25. A NOS is :
(a) A proprietory operation system
(b) A network operating system
(c) A non operable system
(d) All of the above ( )

26. Which of the following conditions is not responsible for a deadlock to occur?
(a) Mutual exclusion (b) Wait and Hold
(c) No preemption (d) Semaphore ( )

27. An Operating System Works as:
(a) An Extended Machine (b) A Resource Manager
(c) Both A & B (d) Neither (a) or (b) ( )

28. In UNIX, the command to terminate execution of a program is:
(a) kill (b) fork
(c) stop (d) end ( )

29. The default file system windows 2000 server of a program is:
(a) Ext 3 (b) NTES
(c) CDFS (d) FAT 32 ( )

30. If banker's Algorithm is to deadlock, then, Paging is to:
(a) Memory Management
(b) Scheduling
(c) Threads
(d) None of the above ( )

31. A Complier:
(a) Converts a HLL program into a machine language program
(b) Converts a HLL program into a machine language program and executes it
(c) Converts a machine language program into executable Program

(d) None of the above ( )

32. Busy waiting is a technique:
(a) to allow the CPU wait for a busy device
(b) to allow a busy device wait for the CPU
(c) To keep an idle device busy
(d) Improve CPU performance ( )

33. An assembly language program is typically:
(a) Non-portable
(b) Shorter than equivalent HLL program
(c) Harder to read than a machine code program
(d) Slower to execute than a complied HLL program ( )

34. Which of the following is not an example of an operating system?
(a) Windows (b) Adobe/e
(c) Mac OS (d) Linux ( )

35. This type of boot occurs when the computer is already on, and you restart it without turning off the power.
(a) Generic boot (b) Live boot
(c) Warm boot (d) Cold boot ( )

36. Which is of the following is a type of utility to reduce the size of files to increase the amount of available disk space:
(a) File compression utility (b) Antivirus utility
(c) Troubleshooting utility (d) Uninstall utility ( )

37. Most operating systems are designed to run with a specific:
(a) Type of processor (b) Manufacturer's printer
(c) Brand of computer (d) Style of keyboard ( )

38. A technique that can be used when a very long program exceeds the storage capacity of memory is called:
(a) Windowing (b) Timesharing
(c) Linkage editing (d) Virtual memory ( )

39. Which of the following operating system software is available for free over the Internet?
(a) MS DOS (b) Linux
(c) Windows 95 (d) Virtual Memory ( )

40. An operating system designed for use on both PCs at home and on server in business is:
(a) Windows XP (b) Windows Me
(c) Windows NT (d) Windows ( )

Answer Key

1. (d)	2. (d)	3. (d)	4. (a)	5. (a)	6. (b)	7. (a)	8. (c)	9. (a)	10. (a)
11. (a)	12. (c)	13. (a)	14. (b)	15. (b)	16. (a)	17. (a)	18. (d)	19. (d)	20. (c)
21. (a)	22. (b)	23. (b)	24. (c)	25. (b)	26. (d)	27. (c)	28. (a)	29. (b)	30. (a)
31. (a)	32. (b)	33. (a)	34. (b)	35. (c)	36. (a)	37. (a)	38. (d)	39. (b)	40. (a)

DESCRIPTIVE PART - II

Year 2006

Time allowed : 2 Hours **Maximum Marks : 30**

Attempt any four questions out of the six. All questions carry 7½ marks each.

Q.1 (a) Discuss the evolution of operating system from a simple JCL, program to a multiprogramming operating system.

(b) Define semaphore; are P-V operations refer to 'SIGNAL' and 'WAIT' operations?

Q.2 (a) What is memory fragmentation? Discuss various type of fragmentation and their causes?

(b) What is thread? Differentiate between kernel level threads and user level threads.

Q.3 (a) Discuss round robin strategy of CPU scheduling. Explain the importance of selection of appropriate time quantum in this strategy.

(b) What are the primary function of a basic disk controller?

(c) Define 'Mutual Exclusion'

Q.4 (a) Discuss major security threats to computer based systems, as provided by their users and providers.

(b) What is a virus in context of computer?

Q.5 (a) Define interrupts, service routine and interrupt vectoring?

(b) What is a "process switch" or context switch"?

(c) Discuss the LRU page replacement policy.

Q.6 Differentiate between (any there)

(a) Process and program.

(b) Real time system and embedded system.

(c) File attributes and file operations.

(d) Refer tock time and rotational delay.

Keywords

BIOS (basic input/output system) - BIOS (basic input/output system) is the program a personal computer's microprocessor uses to get the computer system started after you turn it on.

CPU bound-A property of a process in which processor use is high, and I/O requests are low.

ASCII- A 7 bit code for representing American English characters and device controls.

Direct Memory Access- The transfer of data between memory and a peripheral directly, without passing through the CPU.

FIFO scheduling-A scheduling policy which schedules tasks in the same order in which they enter the ready state.

I/O bound-A property of a process in which processor use is low, and I/O requests are high.

LFU Page Replacement- A strategy which replaces the page which has been used least often.

Round Robin scheduling- A scheduling policy which scheduleses tasks in a fixed circular order.

SCAN disk scheduling- A disk scheduling strategy which satisfies the pending disk request which is physically closest to the current position of the access arm in the current direction of motion, reversing direction when the first and last cylinders are reached.

SRAM- Semiconductor read-write memory in which individual bit cells stable as long as power is maintained.

Unicode- A 16 bit code for representing characters.

base register- A register which contains a value which is added to virtual memory addresses to produce a memory address.

batch process- A process which executes without user interaction.

best fit- A placement strategy which selects the smallest space from the free list which is large enough.

binary semaphore- A semaphore that can only have the values 0 and 1.

blocked list- An operating system data structure which contains all of the blocked processes in the system.

blocked state- A process state entered by a task which is waiting for some event or action to occur.

born state- The tread state in which a new thread begins life.

Bus- A communication pathway that connects two or more of the major components of a computer system, including CPU, memory, and device controllers.

busy wait-A situation in which a process, while not blocked, continuously checks for a condition which will allow it to proceed.

Byte- The smallest addressable part of memory.

Cache- Solid state memory used to buffer and store data temporarily.

Compiler- A translator from a high level language to a low level language.

dead state- The state of a thread after it has been terminated.

demand paging- A paging policy which reads in a page only when it is referenced.

Dispatcher- The operating system component which transitions a process to the running state.

information hiding- A program style which which masks implementation details of a module from the rest of the code.

interactive process- A process which requires user interaction while executing.

Interpreter- A program expressed in one language which executes programs expressed in another language.

Interrupt- An asynchronous service request from hardware or software to the CPU.

interrupt handler- A software routine which processes interrupts.

Join- Thread operation in which the calling thread is blocked until the thread it joins terminates.

Middleware- Software that sits between two or more types of software and translates information between them.

mutual exclusion- A situation in which at most one process can be engaged in a specified activity at a time.

noncontiguous memory allocation- Allocation in which the address space is separated into nonadjacent regions.

Nonpreemptive- Not having the capability of preempting running tasks.

Page-A fixed size block of contiguous memory addresses in a virtual address space which is managed as a unit.

page fault-An interrupt generated when a program references a page that is not currently resident.

process control block- An operating system data structure that characterizes a proce

process state- The status of a process as running, ready, blocked, etc.

process table- An operating system data structure which pointers to all of the processes in the system.

Producer- A process or thread that creates data and places it into a shared object.

Program-A (static) set of instructions which can be used as the basis for a process.

race condition-A situation where the (uncontrolled) ordering of events can affect the outcome of the situation.

ready list- An operating system data structure which contains all of the ready processes in the system.

ready state- A process state in which all resources except the processor are available.