

Department of Computer Science

Gujarat University



Certificate

Roll No: 19

Seat No: _____

This is to certify that Mr./Ms. Modi Milind Nileskumar student of MCA Semester – III has duly completed his/her term work for the semester ending in December 2020, in the subject of Operating System(OS) towards partial fulfillment of his/her Degree of Masters in Computer Applications.

Date of Submission
10 - December - 2020

Internal Faculty

Head of Department

Department Of Computer Science
Rollwala Computer Centre
Gujarat University

MCA – III

Subject: - Operating System (OS)

Name: - Modi Milind Nileshkumar

Roll No.: - 19 **Exam Seat No.: -** _____

D.S.

Assignment.

- * Definition of the all chapters:-
- * Access method:- The method that is used to find a file, a record, or a set of records,
- * Address Space:- The range of address available to a computer program.
- * Address translator/-
A functional unit that transforms virtual address to real addresses.
- * Application programming interface (API):-
A standardized library of programming tools used by software developers to write applications that are compatible with a specific operating system or graphic user interface.
- * Asynchronous Operations
An operation that occurs without a relation on predictable time relationship to specified event.

* base address:-

An address that is used as the origin in the calculation of address in the execution of a computer program.

* batch Processing:-

Pertaining to the technique of executing a set of computer programs such that each is completed before the next program of the set is started.

* Beowulf:-

Defines a class of clustered computing that focuses on minimizing the price-to-performance ratio of the overall system without compromising its ability to perform the computation work for which it is being built.

* binary semaphore:-

A semaphore that takes on only the values 0 & 1. A binary semaphore allows only one process or thread to have access to a shared critical resource at a time.

* block :-

- (1) A collection of contiguous records that are recorded as a unit; the units are separated by interblock gaps.
(2) A group of bits that are transmitted as a unit.

* B-tree :-

A technique for organizing indexes. In order to keep access time to a minimum, it stores the data keys in a balanced hierarchy that continually reassigns itself as items are inserted and deleted. Thus, all nodes always have a similar number of keys.

* busy waiting :-

The repeated execution of a loop of code while waiting for an event to occur.

* Cache memory :-

A memory that is smaller and faster than main memory & that is interposed between the processor and

main memory, the cache acts as a buffer for frequently used memory locations.

* Central Processing unit (CPU):-

That portion of a computer that fetches and executes instructions. It consists of an Arithmetic & logic Unit (ALU), a control unit, & registers often simply referred to as a processor.

* Chained list:-

A list in which data items may be dispersed but in which each item contains an identifier for locating the next item.

* Client:-

A process that requests services by sending messages to serve processes.

* Cluster:-

A group of interconnected, whole computers working together as a unified computing resource that can break the illusion of being one machine. The term whole computer means a system that can run on its own, apart from the cluster.

* Communications Architecture:-

The hardware and software structure that implements the communications functions

③ * Compaction:-

A technique used when memory is divided into variable-size partitions. From time to time, the operating system shifts the partitions so that they are contiguous and so that all of the free memory is together in one block. See external fragmentation.

* Concurrent:-

Pertaining to processes or threads that take place within a common interval of time during which they may have to alternately share common resources.

* Consumable resource:-

A resource that can be created and destroyed. When a resource is acquired by a process, the resource ceases to exist. Examples of consumable resources are interrupts, signals, messages, and information in I/O buffers.

* Critical section:-

In a synchronous procedure of a computer program, a part that cannot be executed simultaneously with an associated critical section of another synchronous procedure.

* Database :-

A collection of interrelated data, often with controlled redundancy, organized according to a schema to serve one or more applications; the data are stored so that they can be used by different programs without concern for the data structure or organization.

* deadlock :-

(1) An impasse that occurs when multiple processes are waiting for the availability of a resource that will not become available because it is being held by another process that is in a similar wait state.

(2) An impasse that occurs when multiple processes are waiting for an action by or a response from another process that is in similar wait state.

* Deadlock avoidance:-

A dynamic technique that examines each new resources request for deadlock. If the new request could lead to a deadlock, then the request is denied.

* Deadlock detection:-

A technique in which requested resources are always granted when available. Periodically, the operating system tests for deadlock.

* Deadlock prevention:-

A technique that guarantees that a deadlock will not occur. Prevention is achieved with not occur for by assuming that one of the necessary conditions for deadlock is not met.

* Deadlock demand paging:-

The transfer of a page from

(1)

Temporary memory to main memory storage at the moment of need, compare popping.

* Device Driver :-

An operating system module that deals directly with a device or I/O module.

* Direct Access :-

The capability to obtain data from a storage device or to enter data into a storage device in a sequence independent of their relative position, by means of addresses that indicate the physical location of the data.

* Direct memory access (DMA) :-

A form of I/O in which a special module, called a DMA module, controls the exchange of data between main memory & an I/O device. The processor sends a request for the

transfer a block of data to the DMA module and is interrupted only after the entire block has been transferred.

* disabled interrupt:-

A condition, usually created by the operating system, during which the processor will ignore interrupt requests signals of a specified class.

* disk allocation table:-

A table that indicates which blocks on secondary storage are free and available for allocation to files.

* disk cache:-

A buffer, usually kept in main memory, that functions as a cache of disk blocks between disk memory & the rest of main memory.

* dispatch:-

To allocate time on a processor to jobs or tasks that are ready for execution.

* distributed operating system:-

A common operating system shared by a network of computers. The distributed operating system provides support for interprocess communication, process migration, mutual exclusion, and the prevention or detection of deadlock.

* dynamic relocation:-

A process that assigns new absolute addresses to a computer program during execution so that the program may be executed from a different area of main storage.

* enabled interrupt:-

A condition, usually created by the

Operating system, during which the processor will respond to interrupt request signals of a specified class,

* Encryption:-

The conversion of plain text or data into unintelligible form by means of a reversible mathematical computation.

* Execution context:-

Same as process state

* External fragmentation:-

Occurs when memory is divided into variable-size partitions corresponding to the blocks of data assigned to the memory. As segments are moved into the and out of the memory, gaps will occur between occupied portions of memory.

* field:-

(1) defines logical data that are part of a record. (2) The elementary unit of a record that may contain a data item, a data aggregate,

a pointer, or a link.

* file -

A set of related records treated as a unit.

* file allocation table (FAT) :-

A table that indicates the physical location on secondary storage of the space allocated to a file. There is one file allocation table for each file.

* file management system / -

A set of system software that provides services to users and applications in the use of files, including file access, directory maintenance, and access control.

* file organization / -

The physical order of records in a file, as determined by the access method used to store and retrieve them.

* First in first out (FIFO) :-

A queuing technique in which the next item to be retrieved is the item that has been in the queue for the longest time.

* First come First served (FCFS) :-

Same as FIFO.

* Frame :-

In paged virtual storage, a fixed-length block of main memory that is used to hold one page of virtual memory.

* Bang Scheduling :-

The scheduling of a set of related threads to run on a set of processors at the same time, on a one-to-one basis.

* hash file :-

A file in which records are accessed according to the values of a key field. Hashing is used to locate a record on the basis of its key value.

* Hashing :-

The selection of a storage location for an item of data by calculating the address as a function of the contents of the data. This technique complicates the storage allocation function but results in rapid random retrieval.

* Hit ratio :-

In a two-level memory, the fraction of all memory accesses that are found in the faster memory.

* Indexed access :-

Pertaining to the organization and accessing of the records of a storage structure through a separate index to the locations of the stored records.

* Indexed file :-

A file in which records are accessed according to the value of key fields. An index is required that indicates the location of each record on the basis of each key value.

* indexed sequential Access -

Pertaining to the organization and accessing of the records of a storage structure through an index of the keys that are stored in arbitrary partitioned sequential files.

* indexed sequential file -

A file in which records are ordered according to the values of a key field. The main file that contains a partial list of key values; the index provides a lookup capability to quickly reach the vicinity of a desired record.

* instruction cycle -

The time period during which one instruction is fetched from memory and executed when a computer is given an instruction in machine language.

* internal fragmentation

Occurs when memory is divided into fixed-size partitions. If a block of data is assigned to one or more partitions, then there may be wasted space in the last portion.

This will occur if the last portion of data is smaller than the last portion.

* **interrupt:-**

A suspension of a process, such as the execution of a computer program, caused by an event external to that process & performed in such a way that the process can be resumed.

* **Interrupt handler:-**

A routine, generally part of the operating system, when an interrupt occurs, control is transferred to the corresponding interrupt handler, which takes some action in response to the condition that caused the interrupt.

* **Job:-**

A set of computational steps packaged to run as a unit.

* **Job Control Language (JCL):-**

A problem-oriented language that is designed to express statements in a

jobs that are used to identify the jobs or to describe its requirements to an operating system

* Kernel:-

A portion of the operating system that includes the most heavily used portions of software. Generally, the kernel is maintained permanently in main memory. The kernel runs in a privileged mode & responses to calls from processes and interrupt from devices.

* last in first out (LIFO):-

A queuing technique in which the next item to be prioritized is the item most recently placed in the queue.

* lightweight process:-

A thread.

* livelock:-

A condition in which two or more processes continuously change their state

in response to changes in the other processes without doing any useful work. This is similar to deadlock in that no progress is made, but it differs in that neither process is blocked or waiting for anything.

* locality of reference:-

The tendency of a process to access the same set of memory locations repetitively over a short period of time.

* logical address:-

A reference to a memory location independent of the current assignment of data to memory. A translation must be made to a physical address before the ~~mem~~ memory access can be achieved.

* logical record:-

A record independent of its physical environment; positions of one logical record may be located in different physical records or several logical records on parts of logical

records may be located in one physical record.

* macrokernel:-

A large operating system core that provides a wide range of services.

* mailbox:-

A data structure shaped among a number of processes that is used as a queue for messages, messages are sent to the mailbox and received from the mailbox rather than passing directly from sender to receiver.

* Main memory:-

Memory that is internal to the computer system, is program addressable and can be loaded into registers for subsequent execution or processing.

* memory cycle time:-

The time it takes to read one word from or write one word to memory. This is the inverse of the rate at which words can be read from

or written to memory.

* memory partitioning:-

The subdividing of storage into independent sections.

* message:-

A block of information that may be exchanged between processes as a means of communication.

* microkernel:-

A small privileged operating system core that provides process scheduling, memory management, & communication services & relies on other processes to perform some of the functions traditionally associated with the operating system kernel.

* mode switch:-

A hardware operation that occurs that causes the processor to execute in a different mode, when the mode switches from process to kernel, the program counter, processor status word, and other registers are saved. When the

mode switches from kernel to process,
this information is restored.

* monitor -

A Programming language construct
that encapsulates variables access procedures
& initialization code within an abstract
data type. The monitor's variable may
only be accessed via its access
procedures and only one process may
be actively accessing the monitor at
any one time.

* multilevel security -

A capability that enforces
access control across multiple levels
of classification of data.

* multiprocessing -

A mode of operation that provides
for parallel processing by two or more
processes of a multiprocessor.

* multiprocessor -

A computer that has two or
more processors that have ~~two~~ ^{common}
access to a ~~main~~ main storage.

* multiprogramming :-

The number of processes that are partially or fully resident in memory,

* multitasking:-

A mode of operation that provides for the concurrent performance of interleaved execution of two or more computer tasks. The same as multiprogramming, using different terminology,

* mutex:-

Similar to a binary semaphore. A key difference between the two is that the process that locks the mutex must be the one to unlock it. In contrast, it is possible for one process to lock a binary semaphore & for another to unlock it.

* mutual exclusion:-

A condition in which there is a

Set of processes, only one of which is able to access given resource or perform a given function at any time.

* nonprivileged state:-

An execution context that does not allow sensitive hardware instructions to be executed. Such as the halt instruction and I/O instructions.

* nonuniform memory access (NUMA) multiprocessor:-

A shared-memory multiprocessor in which the access time from a given processor to a word in memory varies with the location of the memory word.

* Object request broker:-

An entity in an object-oriented system that acts as an intermediary for requests sent from a client to a server.

* Page:-

In virtual storage, a fixed-length block that has a virtual address and that is transferred as a unit between main memory and secondary memory.

* Page frame:-

A fixed-size contiguous blocks of main memory used to hold a page.

* Paging :-

The transfer of pages between main memory & secondary memory.

* Page fault:-

Occurs when the page containing a referenced word is not in main memory. This causes an interrupt and requires that proper page be brought into main memory.

* Physical address:-

The absolute location of a unit of data in memory.

* Pipe:-

A circular buffer allowing two processes to communicate on the producer-consumer model. Thus, it is a first-in-first-out queue, written by one process and read by another.

* Preempting:-

Reclaiming a resource from a process before the process has finished using it.

* Prefetching:-

The retrieval of pages other than the one demanded by a page fault. The hope is that the additional pages will be needed in the near future, conserving disk I/O. Compare demand paging.

* Priority inversion:-

A circumstance in which the operating system forced a higher priority task to wait for a lower-priority task.

* Privileged instruction:-

An instruction that can be executed only in a specific mode, usually by a supervisory program.

* Privileged instruction mode:-

Same as kernel mode.

* Process:-

A program in execution. A process is controlled and scheduled by the operating system. Same as task.

* Process control block:-

The manifestation of a process in an operating system. It is a data structure containing information about the characteristics and state of the process.

* process descriptor:-

Same as process control block.

* Process image:-

All of the ingredients of a process, including program, data, stack, and

Process control blocks.

* Process migration:-

The transfer of a sufficient amount of the state of a process from one machine to another for the process to execute on the target machine.

* Process spawning:-

The creation of a new process by another process.

* Process state:-

All of the information that the operating system needs to manage a process and that the processor needs to properly execute the process. The process state includes the contents of the various processor registers, such as the program counter and data registers; it also includes information of use to the operating system, such as the priority of the process and whether the process is waiting for the completion of a particular I/O request. Some as execution context.

* Process Switch:-

An operation that switches the processor from one process to another, by saving all the process control block, registers, and other information for the first and replacing them with the process information for the second.

* Processor:-

In a computer, a functional unit that interprets and executes instructions. A processor consists of at least an instruction control unit and an arithmetic unit.

* Program Counter:-

Instruction address register.

* Program Status word (PSW) :-

A register or set of registers that contains condition codes, execution mode, and other status information that reflects the state of a process.

* Programmed I/O:-

A form of I/O in which the CPU issues an I/O command to an I/O module and must then wait for the operation to be complete before proceeding.

* Race Condition:-

Situation in which multiple processes access and manipulate shared data with the outcome dependent on the relative timing of the processes.

* Real Address:-

A physical address in main memory.

* Real-time System:-

An operating system that must schedule & manage real-time tasks.

* Real-time task :-

A task that is executed in connection with some process or function or set of events external to the computer system and that must meet one or more deadlines to interact effectively and correctly with the external environment.

* Record :-

A group of data elements treated as a unit.

* Interrupt procedure :-

A routine that may be entered before the completion of a prior execution of the same routine and execute correctly.

* Registries :-

High-speed memory internal to the CPU. Some registers are user-visible—that is, available to the programmer via the machine instruction set. Other

Registers are used only by the CPU, for control purposes.

* Relative address:-

An address calculated as a displacement from a base address.

* Remote procedure call (RPC) :-

A technique by which two programs on different machines interact using procedure call / return syntax and semantics. Both the called and calling program behave as if the partner program were running on the same machine.

* rendezvous! -

In message passing, a condition in which both the sender and receiver of a message are blocked until the message is delivered.

* Resident set / -

That portion of a process that is actually in main memory at a given time. Compare working set.

* Response time / -

In a data system, the elapsed time between the end of transmission of an enquiry message and the beginning of the receipt of a response message, measured at the enquiry terminal.

* Reusable resource / -

A resource that can be safely used by only one process at a time and is not depleted by that user. Processes obtain reusable resource units that they later release for reuse by other processes.

Examples of reusable resources include processors, I/O channels, main and secondary memory, devices & data structures such as files, database, and semaphores.

* Scheduling:-

To select jobs or tasks that are to be dispatched, in some operating systems, other units of work, such as input/output operations, may also be scheduled.

* Secondary memory:-

memory located outside the computer system itself; that is, it cannot be processed directly by the processor. It must first be copied into main memory. Examples include disk & tape.

* Segment:-

In virtual memory, a block that has a virtual address. The blocks of a program may be of unequal length and may even be of dynamically varying lengths.

* Segmentation:-

The division of a program or application into segments as part of a virtual memory scheme.

* Sequential access:-

The capability to enter data into a storage device on a medium in the same sequence as the data are ordered, or to obtain data in the same order as they were entered.

* Sequential file:-

A file in which records are ordered according to the values of one or more key fields and processed in the same sequence from the beginning of the file.

* Server:-

- (1) A process that responds to request from clients via messages.
- (2) In a network, a data station that provides facilities to other stations; for example, a file server, a print server, a mail server.

* Session:-

A collection of one or more processes that represents a single interactive user application on operating system function. All keyboard and mouse input is directed to the foreground session, and all output from the foreground session is directed to the display screen.

* Shell:-

The portion of the operating system that interprets interactive user commands and job control language commands. It functions as an interface between the user and the operating system.

* Spin lock:-

A mutual exclusion mechanism in which a process executes in an infinite loop waiting for the value of a lock wait variable to indicate availability.

★

Starvation :-

A condition in which a process is indefinitely delayed because other processes are always given preference.

★

Strong semaphore

A semaphore in which all processes waiting on the same semaphore are queued and will eventually proceed in the same ordered as they entered the wait (P) operations (FIFO order).

★

Scapping :-

A process that interchanges the contents of an area of main storage with the contents of an area in secondary memory.

★

Synchronization :-

Situation in which two or more processes coordinate their activities based on a condition.

* System bus -

A bus used to interconnect major computer components (CPU, memory, I/O)

* System mode -

same as kernel mode.

* Task - same as process,

* thrashing -

A ~~phone~~ phenomenon in virtual memory schemes, in which the processor spends most of its time swapping pieces rather than executing ~~less~~ instructions,

* thread switching -

The act of switching processor control from one thread to another within the same process.

* time sharing -

The concurrent use of a device

by a number of users.

* time slice :-

The maximum amount of time that a process can execute before being interrupted.

* trace -

A sequence of instructions that are executed when a process is running.

* virtual address :-

The address of a storage location in virtual memory.

- * trusted system :-

A computer and operating system that can be verified to implement a given security policy.

* user mode:-

The least-privileged mode of execution, certain regions of main memory & certain machine instructions cannot be used in this mode.

Banker's Algorithm.

Q1 process	Allocation			Available A B C	Required		
	A	B	C		A	B	C
P ₀	0	1	0	7 5 3	3	3	2
P ₁	2	0	0	3 2 2		1	2
P ₂	3	0	2	9 0 2		6	0 0
P ₃	2	1	1	2 2 2		0	1 1
P ₄	0	0	2	4 3 3		4	3 1

Q2 →

	Alloc	Max	Avail.	Need
	A B C	A B C	A B C	
P ₀	0 1 0	7 5 3	7 5 5	7 4 3
P ₁	2 0 0	3 2 2	5 3 2	1 2 2
P ₂	3 0 2	9 0 2	1 0 5 7	6 0 0
P ₃	2 1 1	2 2 2	0 7 4 3	0 1 1
P ₄	0 0 2	4 3 3	7 4 5	4 3 1

P₁ → P₃ → P₄ → P₀ → P₂.

Q FIFO

7, 0, 1, 3, 0, 3, 0, 4, 2, 3, 0, 3, 0, 32, 1, 2, 0, 1, 7, 0

f ₃		1	1	1	1	0	0	0	3	3	3	3	3
f ₂	0	0	0	0	3	3	3	2	2	2	2	2	2
f ₁	7	7	7	2	2	2	2	4	4	4	0	0	0
	*	*	*	*	WT	*	*	*	*	*	*	WT	WT
	7	0	1	2	0	3	0	4	2	3	0	3	0

3	2	2	2	2	2	1
1	1	1	1	1	0	0
0	0	0	0	1	1	1
*	*	hit	hit	*	*	*
1	2	0	1	1	0	1

Page faults : 15

no frames : 3

* LRU.

7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 0, 3, 0, 3, 2, 1, 2, 0, 1, 5, 7, 0, 1

f2		1	1	1	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2
f2	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	3	3	3	3
f1	7	7	7	2	2	2	2	4	4	4	0	0	0	0	0	0	0	0	1, 1
*	*	*	*	h	*	h	*	*	*	*	*	*	2	4	4	4	*	*	h
7	0	1	2	0	3	0	4	2	3	0	3	0	3	2	1	0	2	1	0

2	2	7	7	7	1
0	0	0	0	0	
1	1	1	1	1	
*	h	h	h	h	
0	1	7	0	1	

frames = 3

page faults = 12

Optimal

frames : 3.

7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 0, 3, 2, 1, 2, 1, 7, 0, 1

		1	1	1	3	3	3	3	3	3	3	3	3	3	3
7	7	7	2	2	2	2	2	2	2	2	2	2	2	2	2
*	*	*	*	h	h	*	h	h	*	h	h	*	h	h	h
7	0	1	2	0	3	0	4	2	3	0	3	0	3	0	2

1	1	1	1	1											
0	0	0	0	0											
2	2	2	2	2	7										
*	h	h	h	*	h	h	h	h	h	h	h	h	h	h	h
1	2	0	1	7	0	1									

Page faults = 6.

=> Optimal

7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 3

1	1	1	2	2	2	2	2	1	2	2	2	2	2	2	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	7	7	7	7	3	3	3	3	3	3	3	3	3	3	3
*	*	*	*	h	*	h	*	h	h	h	h	h	h	h	h
7	0	1	2	0	3	0	4	2	3	0	3	2	3		

Page faults :- 8.

frames : 5.

**DEPARTMENT OF COMPUTER SCIENCE
ROLLWALA COMPUTER CENTRE
GUJARAT UNIVERSITY
M.C.A. – III**

ROLL NO : 19

NAME : Modi Milind Nileshkumar

SUBJECT : Operating System (OS)

Occurrence of each word in file

Delete lines with word “unix”

Stop at the first file that encounter word “unix”

Copy even files

All files in current directory with read, write & execute permissions

File or Directory?

File exists or not? If not create in mydi

Calculate Percentage & Grades

Armstrong numbers between 1 to 500

Acute / Right / Obtuse Angle

Numbers divisible by 7 in 1-100

Smallest & Largest of 3 numbers

HCF & LCM

Dates falling on Sunday of current month