

Department of Computer Science

Gujarat University



Certificate

Roll No: 05

Seat No: _____

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

Date of Submission
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Internal Faculty

Head of Department

Department Of Computer Science
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MCA – III

Subject: - Operating Systems (OS)

Name: - Nirav Manoj Chavda

Roll No.: - 05 **Exam Seat No.: -** _____

OS Assignment

①

* Access Method

The method that is used to find a file, a record, or a set of records.

* Address Space

The range of addresses available to a computer program.

* 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 graphical user interface.

* Asynchronous Operation

An operation that occurs without a regular or predictable time relationship to a specified event, for example, the calling of an error diagnostic routine that may receive control at any time during the execution of a computer program.

* 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.

* Binary Semaphore

A semaphore that takes on only the values 0 and 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 of organizing indices. In order to keep access time to a minimum it stores the data keys in a balanced hierarchy that continually realigns itself as items are inserted and deleted. Thus, all nodes always have a similar number of keys.

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* 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 and that is impased between processor and main memory. The Cache acts as a buffer for recently used memory locations.

* Central Processing Unit (CPU)

That portion of a Computer that fetches and executes instructions. It consists of an Arithmetic and Logic Unit (ALU), a Control Unit and Registers often simply referred to as a Processor.

* Client

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

* Cluster

A group of interconnected, whole computers working together as a unified computing resource, that can create 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 function.

* 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 (produced) and destroyed (consumed). 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.

* Database

A Collection of interrelated data, often with Controlled Redundancy, Organized according to a Scheme 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. A common approach is used to add new data and to modify and retrieve existing data.

* 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 a similar wait state.

* Deadlock Avoidance

A dynamic technique that examines each new resource 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 guaranteed granted when available. Periodically, the Operating System test for deadlock.

* Deadlock Prevention

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

* Demand Paging

The transfer of a page from Secondary memory to main memory storage at the moment of need.

* 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 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 and an I/O device. The processor sends a request for the transfer of 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 request 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 and 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 address 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.

* 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 and out of the memory, gaps will occur between the occupied portions of memory.

* Field

(1) Defined 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 Queueing technique in which the next item to be retrieved is the item that has been in the Queue for the longest time.

* Frame

In paged Virtual frame, Storage, a fixed length block of main memory that is used to hold one page of virtual memory.

* Cong 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 arbitrarily partitioned sequential files.

* Indexed Sequential File

A file in which records are ordered according to the values of a key field. The main file is supplemented with an index file that contains a partial list of key values; the index provides a lookup capability to quickly search 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 (e.g. Page frames in main memory, Physical blocks on disk). If a block of data is assigned to one or more partitions, then there may be wasted space in the last partition. This will occur if the last portion of data is smaller than the last partition.

* Interrupt

A suspension of a process, such as the execution of a Computer Program, caused by an event external to that process and 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 job that are used to identify the job that are used to identify the job 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 and responds to calls from processes and interrupts from devices.

* Kernel Mode

A privileged mode of execution reserved for the kernel of the operating system. Typically, kernel mode allows access to regions of main memory that are unavailable to processes. Execution in a less-privileged mode, and also enables execution of certain machine instruction that are restricted to the kernel mode. Also referred to as system mode or privileged mode.

* Last In First Out (LIFO)

A queuing technique in which the next item to be retrieved 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 program processor 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 memory access can be achieved.

* Logical Record

A record independent of its physical environment; portions of one logical record may be located in different physical records or several logical records. Parts of logical records may be located in one physical record.

* Macros Kernel

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

* Mailbox

A data structure shared among a number of processes that is used as a queue for messages. Messages are sent to the mailbox and retrieved 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 of an program.

* Malicious Software

Any software designed to cause damage to or use up the resources of a target computer. Malicious Software (malware) is frequently concealed within or masquerades as legitimate software. In some cases, it spreads itself to other computers via emails or infected disks. Types of Malicious Softwares include viruses, Trojan horse, worms and hidden software for launching denial-of-service attacks.

* 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 sub dividing of storage into independent sections.

* Message

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

* Micro Kernel

A Small Privileged Operating System Core that provides processes Scheduling, memory management and Communication Services and 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 cause the processor to execute in a different mode (kernel/process). 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.

* Monolithic Kernel

A large kernel containing virtually the complete operating system, including scheduling, file system, device drivers and memory management. All the functional components of the kernel have access to all of its internal data structures and routines. Typically, a monolithic kernel is implemented as a single process with all elements sharing the same address space.

* Monitor

A Programming language Construct that encapsulates Variables, Access Procedures and initialization Code within an Abstract Data type. The monitor's Variable Only be accessed via its access procedures and only one process may be actively accessing the monitor at any one time. The access procedures are Critical Sections. A monitor may have a queue of processes that are waiting to access it.

* 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 processors that share a multiprocessor.

* Multiprocessor

A Computer that has two or more Processors that have common Access to a main storage.

* Multiprogramming

A mode of operation that provides for the interleaved execution of two or more computer programs by a single processor. The same as Multitasking, using different terminology.

* Multiprogramming Level

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

* Multitasking

A mode of operation that provides for the concurrent performance (or 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 (sets the value to 0) must be the one to unlock it (sets the value to 1). In contrast, it is possible for one process to lock a binary semaphore and 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 a given resource or perform a given function at any time.

* Non-Privileged State

An execution context that doesn't allow sensitive hardware instructions to be executed such as the halt instruction and I/O instructions.

* Non Uniform 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.

* Operating System

Software that controls the execution of programs and that provides services such as resource allocation, scheduling, input/output control & data management.

* 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 fault

Occurs when the page Containing a reference word is not in Main memory. This Causes an interrupt and requires that the proper page be brought into main memory.

* Page frame

A fixed Size Contiguous block of main memory used to hold a Page

* Paging

The transfer of Pages between main memory & Secondary memory

* Physical Address

The Absolute location of a Unit of data in memory (eg. word or byte in Main memory, block in Secondary memory)

* Pipe

A Circular buffer allowing two processes to communicate on the Producer-Consumer model. Thus it's a first in first out queue, written by one process and read by another. In some systems, the pipe is generalized to allow any item in the queue to be selected for consumption.

* Preemption

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

* Prepaging

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

* Priority Inversion

A circumstance in which the operating system forces 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.

* 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 the ingredients of a process, including program, data, stack, and process control block.

* Process Migration

The transfer of a sufficient amount of a 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 needs to include 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 event. Similar execution context.

* Process Switch

An operation that switches the processor from one process to another, by saving all the process control block, register 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

Instructions address Register

* Program Status Word (PSW)

A register or Set of registers that Contains Conditions Codes, execution mode and other status information that reflects the state of a process.

* Programmed I/O

A form of I/O in which 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 the main memory.

* Real Time System

An Operating System that must Schedule and manage real time tasks.

* Real-Time Task

A task that is executed in Connection with some process or Junction 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.

* Reentrant Procedure

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

* Registers

High Speed memory internal to the CPU. Some registers are user visible i.e. 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

The portion of a process that is actually in main memory at a given time.

* Response Time

In a data ~~entry~~ 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 use. Process obtain reusable resource units they later release for reuse by other processes. Examples of reusable resources include processor, I/O channels, main & secondary memory, devices & data structures such as files, database and semaphores.

* Round Robin

A scheduling algorithm in which processes are activated in a fixed cyclic order, that is, all processes are in a circular queue. A process that cannot proceed because it is waiting for some event (e.g. termination of a child process or an I/O operation) returns control to the scheduler.

* Scheduling

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

* Secondary Memory

Memory located outside the computer system i.e. 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 length.

* Segmentation

The division of a program or application into segments as part of a Virtual memory Scheme.

* Semaphore

An integer value used for Signalling among processes. Only three operations may be performed on a Semaphore, all of which are atomic: initialize, decrement & increment. Depending on the exact definition of the Semaphore, the decrement operation may result in the blocking of a process and the increment operation may result in the unblocking of a process. Also known as Counting Semaphore or a general Semaphore.

* Sequential Access

The Capability to enter data into a storage device on a data 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 or 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. It functions as an interface between the user and the operating system.

* Spin Lock

Mutual Exclusion mechanism in which a process executes in an infinite loop waiting for the value of a lock variable to indicate availability.

* The use of S.

* Spooling

The use of Secondary memory as buffer storage to reduce processing delays when transferring data between peripheral equipment and the processor of a Computer.

* Stack

An ordered list in which items are appended to and deleted from the same end of the list, known as the top. That is, the next item appended to the list is put at the top, and the next item to be removed from the list is the item that has been in the list the shortest time. The method is characterized as LIFO.

* Starvation

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

* Strong Semaphore

A Semaphore in which all processes waiting on the same Semaphore are queued and will eventually proceed in the same order as that executed the wait(P) operations (FIFO order).

* Swapping

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

* Symmetric Multiprocessing (SMP)

A form of multiprocessing that allows the operating system to execute on any available processor or on several available processors simultaneously.

* Synchronous Operation

An operation that occurs regularly or predictably with respect to the occurrence of a specified event in another process. For example, the calling of an input/output routine that receives control at a pre-coded location in a computer program.

* Synchronization

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

* System Bus

A bus used to inter connect major computer components (CPU, memory, I/O).

* System Mode

Same as kernel mode.

* Task

Same as process.

* Thrashing

A phenomenon in virtual memory schemes, in which the processor spends most of its time swapping pages rather than executing instructions.

* Thread

A dispatchable Unit of work. It includes a Processor Context (which includes the program Counter and Stack pointer) and its own data area for a stack (to enable Subroutine branching). A thread executes sequentially and is interruptible so that the processor can turn to another thread. A process may consist of multiple threads.

* Thread Switch

The act of switching processor context 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.

* Time Slicing

A mode of operation in which two or more processes are assigned quanta of time on the same processor.

* Trace

A Sequence of instructions that are Executed when a Process is Running.

* Translation Look-Aside Buffer (TLB)

A high speed Cache used to hold Recently referenced Page table entries as part of a Paged Virtual memory Scheme. The TLB reduces the frequency of access to main memory to retrieve page table entries.

* Trap

An Unprogrammed Conditional Jump to a Specified address that is automatically activated by the hardware; the location from which the jump was made is recorded.

* Trap Door

An unProgrammed

Secret Undocumented entry point into a program, used to grant access without normal methods of access authentication.

* Trojan Horse

Secret Undocumented routine embedded within a useful program. Execution of the program results in execution of the secret routine.

* 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 and certain machine instructions cannot be used in this mode.

* Virtual Address

The address of a storage location in Virtual memory

* Virtual Memory

The Storage space that may be regarded as addressable main storage by the user of a computer in which virtual addresses are mapped into real addresses. The size of virtual storage is limited by the addressing scheme of the computer system and by the amount of secondary memory available and not by the actual number of main storage locations.



* Virus

Secret Undocumented routine embedded within a useful program. Execution of the program results in execution of the secret routine.

* Weak Semaphore

A Semaphore in which all processes waiting on the same semaphore proceed in an Unspecified Order (i.e. the order is unknown or indeterminate).

* Word

An Ordered set of bytes / bits that is the normal unit in which information may be stored, transmitted or operated on within a given computer. Typically, if a processor has a fixed length instruction set, then the instruction length equals the word length.

* Working Set

The Working Set with Parameter Δ for a process at virtual time t , $W(t, \Delta)$ is the set of pages of that process that have been referenced in the last Δ time units.

* Worm

Programs that can travel from Computer to Computer
via network connections. May contain a virus or
bacteria.

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NumericalsQ.1 Banker's Algorithm

Process	Allocation			Max			Available			Need		
	A	B	C	A	B	C	A	B	C	A	B	C
P ₀	0	1	0	7	5	3	A	B	C	7	4	3
P ₁	2	0	0	3	2	2	3	3	2	1	2	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

→

Process	Allocation			Max			Available			Need		
	A	B	C	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	10	5	7	6	0	0
P ₃	2	1	1	2	2	2	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.2. FIFO → 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1

F ₃	1	1	1	1	0	0	0	3	3	3	3	3	3	2	2
F ₂	0	0	0	0	3	3	3	2	2	2	2	2	2	1	1
F ₁	7	7	7	2	2	2	4	4	4	0	0	0	0	0	0
*	*	*	*	Hit	*	*	*	*	*	Hit	Hit	Hit	Hit	*	*
7	0	1	2	0	3	0	4	2	3	0	3	0	3	2	1

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J_3	2	2	2	1		Page faults : 15
J_2	1	1	0	0		No. of frames: 3
J_1	0	7	7	7		
Hit	*	*	*			
	1	7	0	1		

C.3
= LRU $\rightarrow 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1$

J_3	1	1	1	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2
J_2	0	0	0	0	0	0	0	3	3	3	3	3	3	3	3	3	3	0
J_1	7	7	7	2	2	2	2	4	4	4	0	0	0	0	0	1	1	1
*	*	*	*	Hit	*	Hit	*	*	*	*	Hit	Hit	Hit	Hit	Hit	*	Hit	*
7	0	1	2	0	3	0	4	2	3	0	3	0	3	2	1	2	0	1

7	7	7		3 frames
0	0	0		12 Page faults.
1	1	1		
*	Hit	Hit		
7	0	1		

C.4
= Optimal $\rightarrow 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1$

J_3	1	1	1	3	3	3	3	3	3	3	3	3	3	3	1	1	1
J_2	0	0	0	0	0	0	4	4	4	0	0	0	0	0	0	0	0
J_1	7	7	7	2	2	2	2	2	2	2	2	2	2	2	2	2	2
*	*	*	*	Hit	*	Hit	*	Hit	Hit	*	Hit	Hit	Hit	Hit	*	Hit	Hit
7	0	1	2	0	3	0	4	2	3	0	3	0	3	2	1	2	0



J ₃	1	1	1	1	Page faults : 6.
J ₂	0	0	0	0	
J ₁	2	7	7	7	
Hit	*	Hit	Hit	Hit	
	1	7	0	1	

Q.5 Optimal 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 3

J ₄		2	2	2	2	2	2	2	2	2	2	2	2
J ₃		1	1	1	1	1	4	4	4	4	4	4	4
J ₂		0	0	0	0	0	0	0	0	0	0	0	0
J ₁		7	7	7	7	7	3	3	3	3	3	3	3
*	*	*	x	Hit	*	Hit	*	Hit	Hit	Hit	Hit	Hit	Hit
	7	0	1	2	0	3	0	4	2	3	0	3	2

Frames = 4 Page faults = 6

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

ROLL NO : 05

NAME : Nirav Manoj Chavda

SUBJECT : Operating Systems (OS)

NO.	TITLE	PAGE NO.	DATE	SIGN
1	Calculate Gross Salary		10-Dec-20	
2	Distance between two cities		10-Dec-20	
3	Area of Rectancle & Circle		10-Dec-20	
4	Sum of digits of a number		10-Dec-20	
5	Lognames		10-Dec-20	
6	File details		10-Dec-20	
7	Profit / Loss		10-Dec-20	
8	Odd / Even		10-Dec-20	
9	Prime or Not		10-Dec-20	
10	Leap Year		10-Dec-20	
11	Similar Files		10-Dec-20	
12	--- Cancelled ---		10-Dec-20	
13	--- Cancelled ---		10-Dec-20	
14	Date Display		10-Dec-20	
15	Greeting		10-Dec-20	
16	Menu Driven Interface		10-Dec-20	
17	Arithmetic Calculator		10-Dec-20	
18	Factorial		10-Dec-20	
19	Fibonacci		10-Dec-20	
20	Power of y raised to x		10-Dec-20	
21	Similar to Head/Tail Commands		10-Dec-20	
22	Files > 1000		10-Dec-20	
23	--- Cancelled ---			
24	Prime numbers 1-2=300		10-Dec-20	
25	Combinations of 1, 2, 3		10-Dec-20	
26	Rename each file with extension .PID		10-Dec-20	

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ROLL NO : 05

N A M E : Nirav Manoj Chavda

S U B J E C T : Operating Systems (OS)

27	Occurrence of each word in file		10-Dec-20	
28	Delete lines with word “unix”		10-Dec-20	
29	Stop at the first file that encounter word “unix”		10-Dec-20	
30	Copy even files		10-Dec-20	
31	All files in current directory with read, write & execute permissions		10-Dec-20	
32	File or Directory?		10-Dec-20	
33	File exists or not? If not create in mydir		10-Dec-20	
34	Calculate Percentage & Grades		10-Dec-20	
35	Armstrong numbers between 1 to 500		10-Dec-20	
36	Acute / Right / Obtuse Angle		10-Dec-20	
37	Numbers divisible by 7 in 1-100		10-Dec-20	
38	Smallest & Largest of 3 numbers		10-Dec-20	
39	HCF & LCM		10-Dec-20	
40	Dates falling on Sunday of current month		10-Dec-20	