UNIT 4
VIRTUAL MEMORY
PART A
MULTIPLE CHOICE QUESTIONS:

1. Which of the following involves the separation of logical memory as perceived by the users from physical memory (PgNo:398) [L1]
    a) Virtualmemory
    b) Primary memory
    c) Cache memory
    d) Secondary memory Page

   Answer : a
2. Which process refers to the logical view of a process stored in memory (PgNo:398) [L1]
    a) Sparse Address Space
    b) Virtual Address Space
    c) Memory Address Space
    d) Logical Address Space

   Answer : b
3. Virtual address spaces that includes holes are called as (PgNo:399) [L1]
    a) Sparse Address Space
    b) Virtual Address Space
    c) Memory Address Space
    d) Logical Address Space

   Answer : a
4. Accessing a page marked as invalid causes a ----------(PgNo:403) [L1]
    a) Page swap
    b) Page fault
    c) swap space
    d) Bit space

   Answer : b
5. which has the ability to mark an entry invalid through a valid-invalid bit or a special value of protection bits.(PgNo:404) [L1]
    a) Page table
    b) Demand Paging
    c) swappingd.pure
    d) demand paging

   Answer : a
6. A page fault occurs (PgNo:403) [L1]
    a) when the page is not in the memory

b) when the page is in the memory
c) when the process enters the blocked state
d) when the process is in the ready state

Answer : a

7. _____associates with each page the time when that page was brought into memory.(PgNo:413) [L1]
   a) FIFO page replacement algorithm
   b) Optimal Page replacement algorithm
   c) frame allocation algorithm
   d) page replacement algorithm

   Answer : a
8. The ----------page-replacement algorithm requires that the page with the smallest count be replaced (PgNo:420) [L1]
   a) Most frequently used
   b) frequently used
   c) Dynamically used
   d) least frequently used

   Answer : d
9. The page-replacement algorithm is basedon the argument that the page with the smallest count was probably justbrought in and has yet to be used.(PgNo:420) [L1]
   a) least frequently used
   b) most frequently used
   c) Dynamically used
   d) frequently used

   Answer : b
10. --------- is used to reduce the overhead during page replacement[PgNo 411] [L1]
    a) Bit
    b) Modify bit
    c) Frame
    d) Frequently used page

    Answer : b
11. When the FIFO replacement algorithm mistakenly replaces a page that is still in active use,(PgNo:421) [L1]
    a) I/O is necessary
    b) I/O is not necessary
    c) That page is quickly retrieved from the free-framePool
    d) Both b and C

    Answer : d

12. After allocating the frames to the process the leftoverframescanbeusedasafree-frme buffer pool .This scheme is called as_____(PgNo:423) [L1]
    a) Equal allocation
    b) Proportional allocation
    c) Dynamicallocation
    d) Staticallocation

    Answer : a
13. Memory allocation based on Process size is called as (PgNo:423) [L1]
    a) Equal Allocation
    b) Dynamic allocation
    c) Proportional allocation
    d) Static allocation

    Answer : c
14. ----------allows a process to select a replacement frame from the set of all frames, even if that frame is currentlyallocatedtosomeotherprocess (PgNo:424) [L1]
    a) Global replacement
    b) Local replacement
    c) Uniform replacement
    d) Non-Uniformreplacement

    Answer : a
15. ---------- requiresthateach process electfromonlyits own set of allocated frames. (PgNo:424) [L1]
    a) Global replacement
    b) Local replacement
    c) Uniform replacement
    d) Non-Uniformreplacement

    Answer : b
16. A process cannot control its own page-fault rateis problem of (PgNo:424) [L1]
    a) Global replacement
    b) Local replacement
    c) Uniform replacement
    d) Non-Uniformreplacement

    Answer : a
17. NUMA stands for(PgNo:425) [L1]
    a) Null unified memory access
    b) Neat unified memory access
    c) Non-uniform memory access
    d) Neat uniform memory access

    Answer : c

18. A process is---------- if it is spending more time paging than executing. (PgNo:426) [L1]
    a) Thrashing
    b) Accumulating
    c) Abstracting
    d) Preparing TT

    Answer : a
19. Local replacement algorithm is also called as ---------- (PgNo:427) [L1]
    a) Time replacement algorithm
    b) priority replacement algorithm
    c) State replacement algorithm
    d) Scheduling algorithm

    Answer : b
20. ----------is based on the assumption of locality (PgNo:427) [L1]
    a) Working-set model
    b) State set model
    c) Priority model
    d) Replacement model

    Answer : a
21. Working set window can be defined using (PgNo:427) [L1]
    a) Ω
    b) £
    c) π
    d) △

    Answer : d
22. Raw disk is a ---------- (PgNo:421) [L1]
    a) Sequential array of logical blocks, without any file-system data structures
    b) Non-Sequential array of logical blocks, without any file-system data structures
    c) Sequential array of logical blocks, with file-system data structures
    d) Non-Sequential array of logical blocks, with file-system data structures

    Answer: a
23. When a process is swapped in, its pages are not swapped in all at once. Rather they are swapped in only when the process needs them .This particular method is called as (PgNo:401) [L1]
    a) Lazy swapper
    b) Busy Swapper
    c) Swapper
    d) Smart Swapper

Answer: a

24. PFF stands for ---------- (PgNo:429) [L1]
    a) Page Find Frequency
    b) Page Fault Frequency
    c) Peak Fault Frequency
    d) Peak Find Frequency

    Answer : b

25. Operating system supports different page replacement policy. From the given below option which is not a valid page replacement policy?(PgNo:409) [L1]
    a) Least Recently Used
    b) First in first out
    c) Currently used policy
    d) Optimal page replacement policy

    Answer : c

26. When a page fault occurs for a process that is below its working-set maximum(PgNo:446) [L1]
    a) Secondary memory allocates a page
    b) Virtual memory manager allocates a page from this list of free pages
    c) Main memory allocates a page
    d) Both primary and secondary memory allocates page

    Answer : b

27. Copying a process from memory to disk to allow space for other processes is called _____(Pg No 408) [L1]
    a) Swapping
    b) Deadlock
    c) Demand Paging
    d) Page fault

    Answer : a

28. .The type of memory that allows for very effective multiprogramming and relieves the user of memory size constraints is referred to as (PgNo:397) [L1]
    a) Real memory
    b) Virtual memory
    c) Main memory
    d) Secondary memory

    Answer : b

29. The situation where the processor spends most of its time swapping process pieces rather than executing instructions is called: (PgNo:401) [L1]
    a) Paging
    b) The Principle of Locality
    c) Thrashing

d) Swapping

Answer : c

30. Which one of the following is the simplest page replacement algorithm ?(PgNo:409) [L1]
    a) FIFO
    b) LRU
    c) Optimal
    d) SJF

    Answer : a
31. _____ has the lowest fault rate of all the page replacement algorithms.(PgNo:414) [L1]
    a) Optimal page replacement algorithm
    b) LRU replacement algorithm
    c) FIFO
    d) Counting based

    Answer : a
32. .Optimal page replacement algorithm is also called as _____(PgNo:414) [L1]
    a) LIFO
    b) NRU
    c) Clairvoyant replacement algorithm
    d) Page buffering

    Answer: C
33. In a optimal page replacement algorithm, when a page is to be replaced, which of the following pages is chosen? (PgNo:414) [L1]
    a) Oldest page
    b) Newest page
    c) Frequently occurred page in the future
    d) Not frequently occurred page in the future

    Answer : d
34. Optimal page replacement algorithm is implemented in _____(PgNo:414) [L1]
    a) General-purpose operating system
    b) Special-purpose operating system
    c) In any kind of operating system
    d) In Windows only

    Answer : b
35. The two methods how LRU page replacement policy can be implemented in hardware are:(PgNo:416) [L1]
    a) Counters

b) RAM & Registers
c) Stack & Counters
d) Registers

Answer : c

36. .Which is a technique to efficiently copy data resources in a computer system(PgNo:408) [L1]
    a) Copy-on-write
    b) Swapping
    c) Thrashing
    d) Paging

    Answer : a

37. . _____ algorithm associates with each page the time when the page was brought into memory.(PgNo:413) [L1]
    a) Optimal page replacement
    b) FIFO
    c) LRU replacement algorithm
    d) Counting based replacement

    Answer : b

38. Which of the following page replacement algorithms return the minimum number of page faults?(PgNo:416) [L1]
    a) LRU replacement algorithm
    b) Optimal page replacement algorithm
    c) FIFO
    d) Counting based replacement

    Answer : b

39. Which of the following is the main drawback of FIFO page replacement algorithm? (PgNo:413) [L1]
    a) Requirement of large memory
    b) Frame allocation
    c) Reduction in multiprogramming
    d) Reduced optimality

    Answer : c

40. . Which of the following is required to determine the number of page faults in FIFO? (PgNo:413) [L1]
    a) Page number
    b) Page frame number
    c) Memory capacity
    d) Segment number

    Answer : b

41. In a FIFO algorithm, when a page is to be replaced, which of the following page is chosen?(PgNo:413) [L1]
    a) Oldest page
    b) Newest page
    c) Frequently occurred page in past
    d) Frequently occurred page in future

    Answer : a
42. .FIFO algorithm is used by _____ operating system.(PgNo:413) [L1]
    a) Linux
    b) Mac
    c) Windows
    d) VAX/VMS

    Answer : d
43. .The maximum number of frames per process is defined by _____(PgNo:403) [L1]
    a) the amount of available physical memory
    b) operating System
    c) instruction set architecture
    d) information set architecture

    Answer : a
44. Pages used to satisfy copy-on-write duplications are typically allocated using _____(PgNo:408) [L1]
    a) zero-fill-on-demand
    b) demand paging
    c) page fault
    d) thrashing

    Answer : a
45. Which one of the following is a valid statement (PgNo: 421) [L1]
    a.Page is quickly retrieved from the free-frame
    b.No I/O is necessary
    a) a is valid
    b) b is valid
    c) Both a and b are valid
    d) Both a and b are in valid

    Answer : c
46. Thrashing occurs when(PgNo:425) [L1]
    a) When a page fault occurs
    b) Processes on system frequently access pages not memory
    c) Processes on system are in running state
    d) Processes on system are in waiting state

Answer : b

47. ._____ is the concept in which a process is copied into the main memory from the secondary memory according to the requirement.(PgNo:401) [L1]
    a) Paging
    b) Demand paging
    c) Segmentation
    d) Swapping

    Answer : b

48. Working set model for page replacement is based on the assumption of _____ (PgNo:402) [L1]
    a) modularity
    b) locality
    c) globalization
    d) random access

    Answer : b

49. When a program tries to access a page that is mapped in address space but not loaded in physical memory, then _____(PgNo:403) [L1]
    a) segmentation fault occurs
    b) fatal error occurs
    c) page fault occurs
    d) no error occurs

    Answer : c

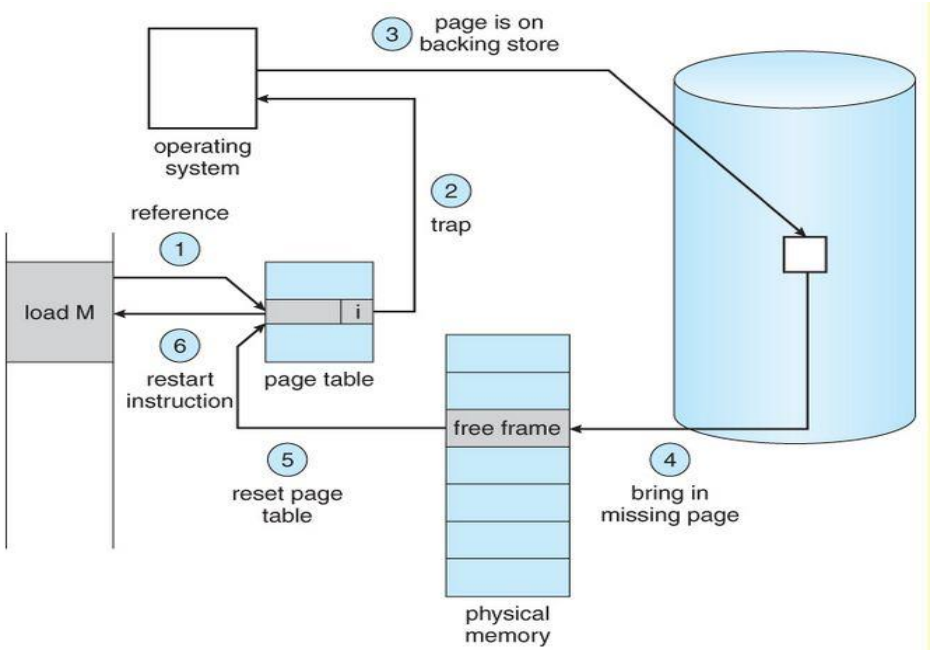
50. The aim of creating page replacement algorithms is to _____(PgNo:409) [L1]
    a) Increase the page fault rate
    b) Decrease the page fault rate
    c) To allocate multiple pages to processes
    d) To deallocate pages to processors

    Answer : c

PART B

4 MARKS:

1. Give the steps in handling a page fault in pictorial representation. (PgNo:403) [L2]



2. Define pure demand paging. (PgNo 404) [L2]
   - There are cases when no pages are loaded into the memory initially, pages are only loaded when demanded by the process by generating page faults. This is called Pure Demand Paging.
   - In pure demand paging, even a single page is not loaded into memory initially.
   - Hence pure demand paging causes a page fault When starting execution of a process with no pages in memory, the operating system sets the instruction pointer to the first instruction of the process, which is on a non-memory resident page, the process immediately faults for the page.
   - After this page is brought into memory, the process continues to execute, faulting as necessary until every page that it needs is in memory.
   - At that point, it can execute with no more faults. This schema is pure demand paging.

3. What is locality model?(PgNo: 404) [L2]

- The locality model states that, as a process executes, it moves from locality to locality. A locality is a set of pages that are actively used together . A program is generally composed of several different localities, which may overlap.
- For example, when a function is called, it defines a new locality. In this locality, memory references are made to the instructions of the function call, its local variables, and a subset of the global variables. When we exit the function, the process leaves this locality, since the local variables and instructions of the function are no longer in active use.

4. What is the role of secondary memory in demand paging?(PgNo:404) [L2]
    - Memory that holds those pages that are not present in main memory.
    - The secondary memory is usually a high-speed disk.
    - It is known as the swap device, and the section of disk used for this purpose is known as swap space

5. List out the major components of the page-fault service time(PgNo:406)[L1]
    - 1.Service the page-fault interrupt.
    - 2. Read in the page.
    - 3. Restart the process.

6. How do you limit the effect of thrashing? (PgNo:427)[L2]
    - We can limit the effects of thrashing by using a local replacement algorithm (or priority replacement algorithm).
    - With local replacement, if one process starts thrashing, it cannot steal frames from another process and cause the latter to thrash as well. However, the problem is not entirely solved.
    - If processes are thrashing, they will be in the queue for the paging device most of the time.
    - The average service time for a page fault will increase because of the longer average queue for the paging device.
    - Thus, the effective access time will increase even for a process that is not thrashing.
    - To prevent thrashing, we must provide a process with as many frames as it needs.

7. Define page fault frequency.(PgNo:429) [L2]

- Thrashing has a high page-fault rate. Thus, we want to control the page-fault rate.
- When it is too high,we know that the process needs more frames.
- Conversely, if the page-fault rate is too low, then the process may have too many frames.
- We can establish upper and lower bounds on the desired page-fault rate If the actual page-fault rate exceeds the upper limit, we allocate the process another frame.
- If the page-fault rate falls below the lower limit, we remove a frame from the process.
- Thus, we can directly measure and control the page-fault rate to prevent thrashing.
- As with the working-set strategy,we may have to swap out a process.
- If the page-fault rate increases and no free frames are available, we must select some process and swap it out to backing store.
- The freed frames are then distributed to processes with high page-fault rates.

8. .How to compute effective access time?(PgNo:405)[L3]
   - Let p be the probability of a page fault ($0 \leq p \leq 1$). We would expect p to
   - be close to zero—that is, we would expect to have only a few page faults.
   - The effective access time is then effective access time = $(1 - p) \times ma + p \times$ page fault time.
   - To compute the effective access time, we must know how much time is needed to service a page fault.

9. List out the advantages and disadvantages of demand paging?(PgNo:401)[L2]

   The advantages of Demand Paging :
   - Large virtual memory.
   - More efficient use of memory.
   - Unconstrained multiprogramming.
   - There is no limit on degree of multiprogramming.

   The disadvantages of Demand Paging:
   - Number of tables and amount of processor overhead for handling
   - page interrupts are greater than in the case of the simple paged management techniques.
   - Due to the lack of an explicit constraints on a jobs address space size.

10. What is Virtual Memory?(PgNo:397)[L2]
    - Virtual Memory is a storage scheme that provides user an illusion of having a very big main memory.
    - This is done by treating a part of secondary memory as the main memory.
    - In this scheme, User can load the bigger size processes than the available main memory by having the illusion that the memory is available to load the process. Instead of loading one big process in the main memory, the Operating System loads the different parts of more than one process in the main memory.
    - By doing this, the degree of multiprogramming will be increased and therefore, the CPU utilization will also be increased.
11. Define the schemes of counting –based page replacement (PgNo:420)[L2]

    - The least frequently used (LFU) page-replacement algorithm requires that the page with the smallest count be replaced.
    - The reason for this selection is that an actively used page should have a large reference count.
    - A problem arises, however, when a page is used heavily during the initial phase of a process but then is never used again. Since it was used heavily, it has a large count and remains in memory even though it is no longer needed.
    - One solution is to shift the counts right by 1 bit at regular intervals, forming an exponentially decaying average usage count.The most frequently used (MFU) page-replacement algorithm is based on the argument that the page with the smallest count was probably just brought in and has yet to be used.

12. Write a short notes on equal allocation(PgNo:423)[L2]
    - The easiest way to split m frames among n processes is to give everyone an equal share, m/n frames (ignoring frames needed by the operating system for the moment).
    - For instance, if there are 93 frames and five processes, each process will get 18 frames.
    - The three leftover frames can be used as a free-frame buffer pool. This scheme is called equal allocation.
13. Give a short notes on proportional allocation (PgNo:423)[L2]
    - We allocate available memory to each process according to its size. Let the size of the virtual memory for process pi be si , and define $S = \sum si$.
    - Then, if the total number of available frames is m, we allocate ai frames to process pi, where ai is approximately $ai = si/S \times m$.

- Of course, we must adjust each ai to be an integer that is greater than the minimum number of frames required by the instruction set, with a sum not exceeding m.
- With proportional allocation, we would split 62 frames between two processes, one of 10 pages and one of 127 pages, by allocating 4 frames and 57 frames, respectively, since $10/137 \times 62 \approx 4$, and $127/137 \times 62 \approx 57$.

14. Define NUMA. (PgNo:424) [L2]
    - In systems with multiple CPUs a given CPU can access some sections of main memory faster than it can access others.
    - These performance differences are caused by how CPUs and memory are interconnected in the system.
    - Frequently, such a system is made up of several system boards, each containing multiple CPUs and some memory.
    - The system boards are interconnected in various ways, ranging from system buses to high-speed network connections like Infini Band.
    - As you might expect, the CPUs on a particular board can access the memory on that board with less delay than they can access memory on other boards in the system.
    - Systems in which memory access times vary significantly are known collectively as non-uniform memory access (NUMA) systems, and without exception, they are slower than systems in which memory and CPUs are located on the sam

15. What is thrashing? (PgNo:425)[L2]
    - Thrashing in computing is an issue caused when virtual memory is in use.
    - It occurs when the virtual memory of a computer is rapidly exchanging data for data on hard disk, to the exclusion of most application-level processing.
    - As the main memory gets filled, additional pages need to be swapped in and out of virtual memory.
    - The swapping causes a very high rate of hard disk access.
    - Thrashing can continue for a long duration until the underlying issue is addressed.
    - Thrashing can potentially result in total collapse of the hard drive of the computer. Thrashing is also known as disk thrashing.

16. Write a short notes on Demand paging.(PgNo:401)[L2]
    - Demand paging is referred when not all of a process's pages are in the RAM, then the OS brings the missing(and required) pages from the disk into the RAM.
    - A demand paging system is quite similar to a paging system with swapping where processes reside in secondary memory and pages are loaded only on demand, not in advance.

- When a context switch occurs, the operating system does not copy any of the old program's pages out to the disk or any of the new program's pages into the main memory Instead, it just begins executing the new program after loading the first page and fetches that program's pages as they are referenced.

17. Give a short notes on Working-Set Model (PgNo:427)[L2]
    - This model is based on the above-stated concept of the Locality Model. The basic principle states that if we allocate enough frames to a process to accommodate its current locality, it will only fault whenever it moves to some new locality. But if the allocated frames are lesser than the size of the current locality, the process is bound to thrash.
    - According to this model, based on a parameter A, the working set is defined as the set of pages in the most recent 'A' page references. Hence, all the actively used pages would always end up being a part of the working set.
    - The accuracy of the working set is dependant on the value of parameter A. If A is too large, then working sets may overlap. On the other hand, for smaller values of A, the locality might not be covered entirely.
    - If D is the total demand for frames Now, if 'm' is the number of frames available in the memory, there are 2 possibilities:

      (i) D>m i.e. total demand exceeds the number of frames, then thrashing will occur as some processes would not get enough frames.
      (ii) D<=m, then there would be no thrashing.
      If there are enough extra frames, then some more processes can be loaded in the memory.

      - On the other hand, if the summation of working set sizes exceeds the availability of frames, then some of the processes have to be suspended(swapped out of memory).

18. What is optimal Page replacement algorithm?(PgNo:419)[L2]
    - **Optimal Page Replacement algorithm** → this algorithms replaces the page which will not be referred for so long in future.
    - Although it can not be practically implementable but it can be used as a benchmark. Other algorithms are compared to this in terms of optimality.

19. Define the strategy of page fault frequency (PgNo:429)[L1]
    - Page Fault Frequency is a replacement algorithm that can be used in systems with a local replacement strategy.

- A too high page fault frequency is an indication that the process may be thrashing and an unusually low page fault frequency indicates that too many frames are allocated to the process.
- The algorithm estimates the page fault frequency by measuring the time between page fault interrupts.
- If the page fault frequency is above an upper limit, the process is assigned an extra frame.
- If the page fault frequency is below a lower limit, a frame is removed from the process. A suitable frame to remove can be localized with help from the reference bits in the page table.

20. Mention few Page Replacement strategies.(PgNo:419) [L2]

- **Optimal Page Replacement algorithm** → this algorithms replaces the page which will not be referred for so long in future. Although it can not be practically implementable but it can be used as a benchmark. Other algorithms are compared to this in terms of optimality.
- **Least recent used (LRU) page replacement algorithm** → this algorithm replaces the page which has not been referred for a long time. This algorithm is just opposite to the optimal page replacement algorithm. In this, we look at the past instead of staring at future.
- **FIFO** → in this algorithm, a queue is maintained. The page which is assigned the frame first will be replaced first. In other words, the page which resides at the rare end of the queue will be replaced on the every page fault..

21. When does thrashing Occurs?(PgNo:425) [L3]

- Thrashing in computing is an issue caused when virtual memory is in use. It occurs when the virtual memory of a computer is rapidly exchanging data for data on hard disk, to the exclusion of most application-level processing.
- As the main memory gets filled, additional pages need to be swapped in and out of virtual memory. The swapping causes a very high rate of hard disk access.
- Thrashing can continue for a long duration until the underlying issue is addressed. Thrashing can potentially result in total collapse of the hard drive of the computer.Thrashing is also known as disk thrashing.

22. Define Lazy Swapper. (PgNo: 401)[L2]

- A lazy swapper never swaps a page into memory unless that page will be needed.
- It is used in demand paging

23. Explain the major problems to implement demand paging (PgNo:401)[L2]

The two major problems to implement demand paging is developing

a. Frame allocation algorithm
b. Page replacement algorithm

24. Construct the steps in handling a page fault.(PgNo:403)[L3]

- We check an internal table (usually kept with the process control block)for this process to determine whether the reference was a valid or an invalid memory access.
- If the reference was invalid, we terminate the process. If it was valid but we have not yet brought in that page, we now page it in.
- We find a free frame (by taking one fromthe free-frame list, for example).
- We schedule a disk operation to read the desired page into the newly allocated frame.
- When the disk read is complete, we modify the internal table kept with the process and the page table to indicate that the page is now in memory.
- We restart the instruction that was interrupted by the trap. The process can now access the page as though it had always been in memory.

PART C

12 MARKS:

1.Illustrate Allocation of frames with a suitable example (PgNo: 421) [L3]
2.Elaborate in detail about NUMA? (PgNo:424) [L2]
3.Describe about Thrashing and causes of Thrashing (PgNo: 425) [L2]
4.Outline Working set model with a detailed description. (PgNo:427) [L3]
5.Explain about page replacement algorithms and discuss the difference between them? (PgNo:424) [L2]
6.Discuss about FIFO page replacement algorithms. (PgNo:420)[L2]
7.Elucidate Optimal Page Replacement algorithm. (PgNo:414)[L2]
8.Depict the workflow of LRU Page Replacement Algorithm in detail. (PgNo:416) [L3]
9.Outline the concept of demand paging with its performance. (PgNo:405)[L2]
10.Explain Page Buffering Algorithm in detail. (PgNo:420) [L2]

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UNIT 5

STORAGE MANAGEMENT

PART A

MULTIPLE CHOICE QUESTIONS:

1. _____ has a flat circular shape, like a CD (PgNo: 467)[L1]
    a) Platter
    b) Disk
    c) Tracks
    d) Sector

   Answer: a
2. The heads are attached to a _____ that moves all the heads as a unit (PgNo: 468) [L1]
    a) disk arm
    b) tracks
    c) cylinder
    d) sectors.

   Answer: a
3. The forms of removable disks include CDs, DVDs, and Blu-ray discs as well as removable flash-memory devices known as _____ (PgNo: 469)[L1]
    a) Flash drives
    b) Disk arm
    c) ram
    d) rom

   Answer: a
4. _____was used as an early secondary-storage medium. (PgNo: 469)[L1]
    a) Magnetic tapes
    b) Host controller
    c) Disk controller
    d) Logical blocks

   Answer: a
5. The_____is the additional time for the disk to rotate the desired sector to thedisk head (PgNo: 473)[L1]
    a) Bandwidth
    b) rotational latency
    c) seek time

d) Storage-area network.

Answer: b

6 The SCAN algorithm is sometimes called the_____(PgNo: 476)[L1]

a) shortest-seek-time-first (SSTF) algorithm.
b) elevator algorithm
c) Circular SCAN (C-SCAN) scheduling
d) C-LOOK scheduling

Answer: b

7 . The header and trailer contain information used by the disk controller, such as a sector number and an_____(PgNo: 479)[L1]

a) low-level formatting
b) physical formatting
c) error-correcting code (ECC)
d) soft error

Answer: c

8. To increase efficiency, most file systems group blocks together into larger chunks, frequently called_____(PgNo: 479)[L1]

a) partition
b) logical formatting
c) soft error
d) clusters

Answer: d

9. _____is a low-level task of the operating system. (PgNo: 482)[L1]

a) raw partition
b) Swap-space management
c) page slots
d) swap map

Answer: a

10. A_____is a sequence of characters organized into lines (PgNo: 503)[L1]

a) executable file
b) text file
c) source file
d) file

Answer: b

11. The system must keep a ____to the location in the file where the next write is to take place (PgNo: 506) [L1]

a) Write pointer
b) Read pointer
c) seek
d) Current file position

Answer: a

12. The open-file table also has an_____associated with each file (PgNo: 507) [L1]

a) open-file table
b) open count
c) seek

d) read pointer

Answer: b

13. The UNIX system uses a crude_____stored at the beginning of some files (PgNo:511) [L1]

a) Shell script
b) Magic number
c) exclusive lock
d) shared lock

Answer: b

14. The block number provided by the user to the operating system is normally _____ (PgNo: 514) [L1]

a) Allocation problem
b) relative block number
c) index
d) allocation problem

Answer: b

15. Any entity containing a file system is generally knownasa_____(PgNo: 516) [L1]

a) volume
b) device directory
c) directory
d) volume table of contents

Answer: a

16. The_____provides host-name-to-network-address translations for the entire Internet. (PgNo: 530)[L1]

a) distributed information systems
b) distributed naming services
c) domain name system
d) network information service

Answer: c

17. An_____begins at the root and follows a path down to the specified file. (PgNo: 522) [L1]

a) relative pathname
b) absolute path name
c) current directory
d) current directory

Answer: b

18. _____scheme to determine when the last reference has been deleted and the disk space can be reallocated. (PgNo: 526) [L1]

a) garbage collection
b) hard links
c) mount point
d) collection

Answer:a

19. The industry is moving toward use of the_____as a secure

distributed naming mechanism (PgNo: 531)[L1]

a) common Internet filesystem
b) active directory
c) LDAP (lightweight directory-access protocol)
d) distributed naming services

Answer: c

20. The series of accesses between the open () and close() operations makes up a ____(PgNo:532) [L1]

a) File session
b) Consistency semantics state
c) Information
d) immutable shared files

Answer: c

21. ____is used to Write new information at the end of the file. (PgNo: 534)[L1]

a) Read
b) Execute
c) Delete
d) Append

Answer: d

22. _____is used to Load the file into memory and execute it (PgNo: 534)[L1]

a) Read
b) Execute
c) Delete
d) Append

Answer: b

23. _____provide efficient and convenient access to the disk by allowing data to be stored, located, and retrieved easily (PgNo: 544)[L1]

a) Filesystems
b) I/O control
c) basic filesystem
d) logical file system

Answer: a

24. The_____manages metadata information (PgNo: 545)[L1]

a) logical filesystem
b) file control block(FCB)
c) UNIX filesystem
d) extended filesystem.

Answer: a

25. _____requires that each file occupy a set of contiguous blocks on the disk (PgNo: 553)[L1]

a) Contiguous allocation
b) Dynamic storage-allocation
c) External fragmentation
d) compacts

Answer: a

26. The contiguous-allocation problem can be seen as a particular application of the general _____problem (PgNo: 554)[L1]
    a) Dynamic storage-allocation
    b) External fragmentation
    c) Contiguous allocation
    d) Compacts

    Answer: a

27. Systems require that Contiguous allocation function be done_____(PgNo: 555) [L1]
    a) off-line
    b) on-line
    c) sleeping mode
    d) in run time.

    Answer: a

28. Most modern systems that need defragmentation can perform it_____(PgNo: 555)
    [L1]
    a) off-line
    b) on-line
    c) sleeping mode
    d) in run time.

    Answer: a

29. If that amount proves not to be large enough, another chunk of contiguous space, known as an_____(PgNo: 555)[L1]
    a) extent
    b) compacts
    c) sleeping mode
    d) external fragmentation

    Answer: a

30. The usual solution to the problem is to collect blocks into multiples is called _____ (556) [L1]
    a) extent
    b) compacts
    c) clusters
    d) paging

    Answer: c

31. An important variation on linked allocation is the use of a_____(PgNo: 557)
    [L1]
    a) Dynamic storage-allocation
    b) External fragmentation
    c) Contiguous allocation
    d) file-allocation table (FAT)

    Answer: d

32. _____solves the problem by bringing all the pointers together into one location the index block (PgNo: 557)[L1]

a) Dynamic storage-allocation
b) External fragmentation
c) Contiguous allocation
d) Indexed allocation

Answer: d

33. A block is obtained from the free-space manager, and its address is put inthe _____(PgNo:558)
a) ith-indexed block entry
b) index block
c) entry list.
d) Allocation

Answer: a

34. The first 12 of these pointers of combined scheme point to_____(PgNo: 559)[L1]
a) index block
b) direct blocks
c) indirect blocks
d) single indirect

Answer: b

35. The next three pointers of combined scheme point to_____(PgNo: 559)[L1]
a) index block
b) direct blocks
c) indirect blocks
d) single indirect

Answer: c

36. The first points of a combined schema , point to a_____block, which is an index block containing not data but the addresses of blocks that do contain data. (PgNo: 559)[L1]
a) index block
b) direct blocks
c) indirect blocks
d) single indirect

Answer: d

37. The second points to a_____block, which contains the address of a block that contains the addresses of blocks that contain pointers to the actual data blocks (PgNo: 559)[L1]
a) Double indirect
b) Direct blocks
c) Indirect blocks
d) single indirect

Answer: a

38. The last pointer of combine schema contains the address of a ___block (PgNo:559) [L1]
a) Double indirect
b) Direct blocks
c) Indirect blocks

d) triple indirect

Answer: d

39. For any type of access, contiguous allocation requires only one access to get a_____block (PgNo: 560)[L1]
    a) disk
    b) directblocks
    c) indirect blocks
    d) triple indirect

Answer: a

40. The performance of indexed allocation depends on the_____, on the size of the file, and on the position of the block desired (PgNo: 561)[L1]
    a) Index structure.
    b) instruction
    c) two-level index
    d) two index-block

Answer: a

41. Track of free disk space, the system maintains a_____. (PgNo: 561)[L1]
    a) bit map
    b) bit vector
    c) free-space list
    d) vector

Answer: c

42. Frequently, the free-space list is implemented as a_____(PgNo: 561)[L1]
    a) bit map
    b) bit vector
    c) free-space vector
    d) either bit map or bit vector

Answer: d

43. The systems maintain a separate section of main memoryfora_____(PgNo: 565)[L1]
    a) Page cache
    b) buffer cache
    c) virtual memory
    d) main memory

Answer: b

44. Systems cache file data using a_____(PgNo:565)[L1]
    a) page cache
    b) buffer cache
    c) virtual memory
    d) main memory

Answer: a

45. Including Solaris, Linux, and Windows —use page caching to cache both process pages and file data is known as_. (PgNo: 566)[L1]
    a) Page cache
    b) buffer cache

c) virtual memory
d) unified virtual memory

Answer: d

46. Versions of UNIX and Linux provide a_____cache (PgNo: 566)[L1]
a) Unified buffer
b) buffer cache
c) page cache
d) virtual memory

Answer: a

47. A memory mapping proceeds by reading in disk blocks from the file system and storing them in the buffer cache is known as_____(PgNo: 566)[L1]
a) Unified buffer
b) buffer cache
c) page cache
d) double caching

Answer: d

48. _____occur in the order in which the disk subsystem receives them, and the writes are not buffered (PgNo: 567)[L1]
a) Synchronous writes
b) Asynchronous write
c) read-ahead
d) Free-behind

Answer:a

49._____, the data are stored in the cache, and control returns to the caller. (Pg: 567)[L1]
a) Synchronous writes
b) Asynchronous write
c) read-ahead
d) Free-behind

Answer: b

50. _____removes a page from the buffer as soon as the next page is requested (PgNo:567) [L1]
a) Synchronous writes
b) Asynchronous write
c) read-ahead
d) Free-behind

Answer: d

PART B

4 MARKS:

1. Give the diagrammatic representation of magnetic disks . (Pg No : 467-469)[L2]

- Each disk platter has a flat circular shape, like aCD.

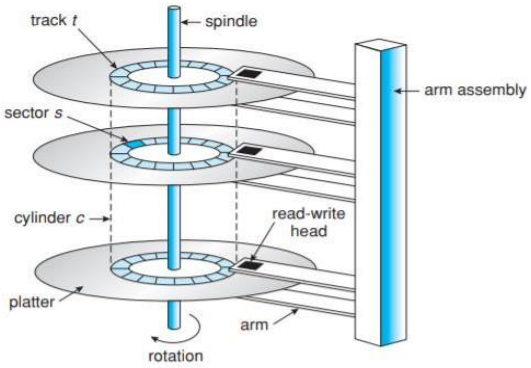
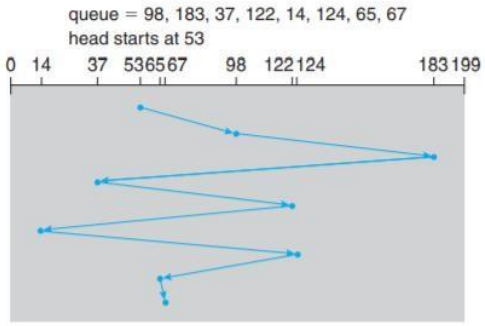


Figure 10.1 Moving-head disk mechanism.

- The two surfaces of a platter are covered with a magnetic material. We store information by recording it magnetically on the platters.
- A read–write head "flies" just above each surface of every platter. The heads are attached to a disk arm that moves all the heads as a unit.
- The surface of a platter is logically divided into circular tracks, which are subdivided into sectors. The set of tracks that are at one arm position makes up a cylinder.

2. Write a note on solid state disk (Pg No : 469,470)[L1]
   - The growing importance of solid-state disks, or SSDs. Simply described, an SSD is nonvolatile memory that is used like a hard drive.
   - SSDs have the same characteristics as traditional hard disks but can be more reliable because they have no moving parts and faster because they have no seek time orlatency.
3. Give a short note on FCFS (Pg No : 473-474)[L1]
   - The simplest form of disk scheduling is, of course, the first-come, first-served (FCFS) algorithm.
   - This algorithm is intrinsically fair, but it generally does not provide the fastest service. Example:



4. Give a difference between SCAN scheduling and CSCAN scheduling (Pg No : 475-476)(L2)

SCAN SCHEDULING:

- In the SCAN algorithm, the disk arm starts at one end of the disk and moves toward the other end, servicing requests as it reaches each cylinder, until it gets to the other end of the disk.
- The SCAN algorithm is sometimes called the elevator algorithm, since the disk arm behaves just like an elevator in a building, first servicing all the requests going up and then reversing to service requests the other way.

CSCAN SCHEDULING:

- Circular SCAN (C-SCAN) scheduling is a variant of SCAN designed to provide a more uniform wait time.
- Like SCAN, C-SCAN moves the head from one end of the disk to the other, servicing requests along the way.

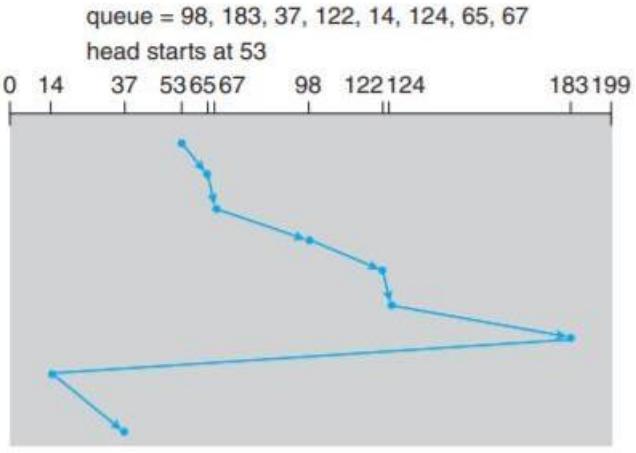
5. Compare LOOK scheduling with Disk- Scheduling Algorithm (Pg No :477-478)[L2]

LOOK SCHEDULING:

- The arm goes only as far as the final request in each direction. Then, it reverses direction immediately, without going all the way to the end of the disk. Versions of SCAN and C-SCAN that follow this pattern are called LOOK and C-LOOK scheduling, because they look for a request before continuing to move in a given direction.

SELECTION OF A DISK-SCHEDULING ALGORITHM :

- SSTF is common and has a natural appeal because it increases performance over FCFS. SCAN and C-SCAN perform better for systems that place a heavy load on the disk, because they are less likely to cause a starvationproblem.



6. Distinguish file attributes and file operation. (Pg No : 504-510)[L2]

FILE ATTRIBUTES

- Name -The symbolic file name is the only information kept in human readableform.
- Identifier- Thisuniquetag,usuallyanumber,identifiesthefilewithinthefilesystem;itisthenon-human-readable name for the file.
- Type - This information is needed for systems that support different types offiles.

- Location. This information is a pointer to a device and to the location of the file on that device.

FILE OPERATION

- Creating a file.
- Writing a file.
- **Write**. Write or rewrite the file
- **Execute**. Load the file into memory and execute it.
- **Append**. Write new information at the end of the file.
- **Delete**. Delete the file and free its space for possible reuse.
- **List**. List the name and attributes of the file.

7.List the types of file (Pg No : 510-511)[L2]

- The system uses the extension to indicate the type of the file and the type of operations that can be done on that file. Only a file with a .com, .exe ,or .sh extension can be executed ,for instance.
- The .comand .exe files are two forms of binary executable files, whereas the .sh file is a shell script containing, in ASCII format, commands to the operatingsystem.

11.1 File Concept

file type	usual extension	function
executable	exe, com, bin or none	ready-to-run machine-language program
object	obj, o	compiled, machine language, not linked
source code	c, cc, java, perl, asm	source code in various languages
batch	bat, sh	commands to the command interpreter
markup	xml, html, tex	textual data, documents
word processor	xml, rtf, docx	various word-processor formats
library	lib, a, so, dll	libraries of routines for programmers
print or view	gif, pdf, jpg	ASCII or binary file in a format for printing or viewing
archive	rar, zip, tar	related files grouped into one file, sometimes com-pressed, for archiving or storage
multimedia	mpeg, mov, mp3, mp4, avi	binary file containing audio or A/V information

8.Compare and contrast sequential and direct access methods (Pg No : 513-514)(L2)

SEQUENTIAL ACCESS:

- The simplest access method is sequential access. Information in the file is processed in order one record after the other.
- Reads and writes make up the bulk of the operations on a file. A read operation—read next()—reads the next portion of the file and automatically advances a file pointer, which tracks the I/O location.

DIRECT ACCESS :

- Another method is direct access (or relative access). Here, a file is made up of fixed-length logical records that allow programs to read and write records rapidly in no particular order.
- For the direct-access method, the file operations must be modified to include the block number as a parameter.

9.State remote file system methods (Pg No :529-532)[L2]

REMOTE FILE SYSTEMS :

- Through the evolution of network and file technology, remote file-sharing methods have changed.
- The second major method uses a distributed file system (DFS) in which remote directories are visible from a local machine.

THE CLIENT–SERVER MODEL:

- Remote file systems allow a computer to mount one or more file systems from one or more remote machines. In this case, the machine containing the files is the serve and the machine seeking access to the files is the client.
- A client can be specified by a network name or other identifier, such as an IP address, but these can be spoofed, or imitated. As a result of spoofing,an unauthorized client could be allowed access to the server.

DISTRIBUTED INFORMATION SYSTEMS:

- To make client–server systems easier to manage, distributed information systems, also known as distributed naming services, provide unified access to the information needed for remote computing.
- The domain name system (DNS) provides host-name-to-network-address translations for the entire Internet.
- It centralizes storage of user names, host names, printer information, and the like. File Sharing Unfortunately, it uses unsecure authentication methods, including sending user passwords unencrypted (in clear identifying hosts by IP address.

10. What is (a) consistency semantics , (b) UNIX semantics, (c) session semantics, (d)Immutable shared files semantics (Pg No : 532-533)[L2]

(a) consistency semantics:

- Consistency semantics represent an important criterion for evaluating any file system that supports file sharing. These semantics specify how multiple users of a system are to access a shared file simultaneously.

(b) UNIXsemantics:

a. Writes to an open file by a user are visible immediately to other users who have this fileopen.
b. One mode of sharing allows users to share the pointer of current location into the file. Thus, the advancing of the pointer by one user affects all sharing users. Here, a file has a single image that interleaves all accesses, regardless of theirorigin.

(c) session semantics:

c. Writes to an open file by a user are not visible immediately to other users that have the same fileopen.
d. Once a file is closed, the changes made to it are visible only in sessions starting later. Already open instances of the file do not reflect thesechange.

(d) Immutable shared files semantics:

- Unique approach is that of **immutable shared files**. Once a file is declared as shared by its creator, it cannot be modified.

.Mention the different type of operation that is used to control the file system .(Pg No : 534) [L2]

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11. Depict file system structure (Pg No : 543-545)[L2]
    - To improve I/O efficiency, I/O transfers between memory and disk are performed in units of **blocks**. Each block has one or more sectors. Depending on the disk drive, sector size varies from 32 bytes to 4,096 bytes; the usual size is 512 bytes.
    - **File systems** provide efficient and convenient access to the disk by allowing data to be stored, located, and retrieved easily. A file system poses two quite different design problems.
    - The **I/O control** level consists of device drivers and interrupt handlers to transfer information between the main memory and the disk system. A device driver can be thought of as a translator.
    - The **basic file system** needs only to issue generic commands to the appropriate device driver to read and write physical blocks on the disk. Each physical block is identified by its numeric disk address.
12. Give a note on following (a) Linear list (b) Hash table (Pg No : 552-553)[L2]

(a) Linear list:

- The simplest method of implementing a directory is to use a linear list of file names with pointers to the data blocks.
- This method is simple to program but time-consuming to execute. To create a new file, we must first search the directory to be sure that no existing file has the same name. Then, we add a new entry at the end of the directory.

(b) Hashtable:

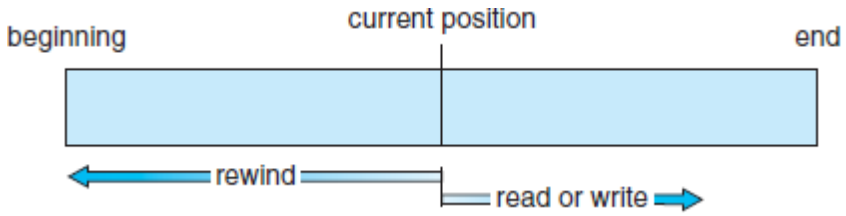
- Another data structure used for a file directory is a hash table. Here, a linear list stores the directory entries, but a hash data structure is also used.
- The hash table takes a value computed from the file name and returns a pointer to the file name in the linear list.

13. Compare and contrast the pros and cons of all types of file allocation methods. (Pg No : 560-561)(L2)
    - The allocation methods that we have discussed vary in their storage efficiency and data- block access times. Both are important criteria in selecting the proper method or methods for an operating system to implement.
    - A file created for sequential access will be linked and cannot be used for direct access. A file created for direct access will be contiguous and can support both direct access and sequential access, but its maximum length must be declared when it is created.
    - Indexed allocation is more complex. If the index block is already in memory, then the access can be made directly. However, keeping the index block in memory requires considerable space.
14. List methods available in free space management (Pg No :561-564).[L1]
    - Bit vector
    - Linked list
    - Grouping
    - Counting
    - Space maps
15. State the file operations that are carried in file system (Pg No : 505)[L2]
    a. Creating a file.
    b. Writing a file.
    c. **Write**. Write or rewrite the file
    d. **Execute**. Load the file into memory and execute it.
    e. **Append**. Write new information at the end of the file.
    f. **Delete**. Delete the file and free its space for possible reuse.
    g. **List**. List the name and attributes of the file.

16. Write a short note on file structure (Pg No : 511)(L3)
    - File types also can be used to indicate the internal structure of the file. For example, the operating system requires that an executable file have a specific structure so that it can determine where in memory to load the file and what the location of the first instruction is.
        - For example, assume that a system supports two types of files: text files (composed of ASCII characters separated by a carriage return and line feed) and executable binary files.
    - Now, if we (as users) want to define an encrypted file to protect the contents from being read by unauthorized people, we may find neither file type to be appropriate. The encrypted file is not ASCII text lines but rather is (apparently) random bits.
17. How the internal file structure operate on file structuring(Pg No : 512)[L2]
    - Internally, locating an offset within a file can be complicated for the operating system. Disk systems typically have a well-defined block size determined by the size of a sector.
    - All disk I/O is performed in units of one block (physical record), and all

blocks are the same size. It is unlikely that the physical record size will exactly match the length of the desired logical record.

- If each block were 512 bytes, for example, then a file of 1,949 bytes would be allocated four blocks (2,048 bytes); the last 99 bytes would be wasted. The waste incurred to keep everything in units of blocks (instead



of bytes) is internal fragmentation.

18. How the multiple users perform in file sharing (Pg No : 528-529)[L2]

- When an operating system accommodates multiple users, the issues of file sharing, file naming, and file protection become preeminent. Given a directory structure that allows files to be shared by users, the system must mediate the file sharing.
- Although many approaches have been taken to meet this requirement, most systems have evolved to use the concepts of file (or directory) **owner** (or **user**) and **group**.
- The owner is the user who can change attributes and grant access and who has the most control over the file. The group attribute defines a subset of users who can share access to the file.
- In these cases, the ID checking and permission matching are straightforward, once the file systems are mounted.

19. What are the failure modes in Remote file sharing (Pg No :531-532)[L2]

- Local file systems can fail for a variety of reasons, including failure of the disk containing the file system, corruption of the directory structure or other m disk-management information (collectively called **metadata**), disk-controller failure, cable failure, and host-adapter failure.
- To implement this kind of recovery from failure, some kind of **state information** may be maintained on both the client and the server. If both server and client maintain knowledge of their current activities and open files, then they can seamlessly recover from a failure.
- In the situation where the server crashes but must recognize that it has remotely mounted exported file systems and opened files, NFS takes a simple approach, implementing a **stateless** DFS.

20. Distinguish direct and sequential access methods.(PgNo:513) (L2)

SEQUENTIAL ACCESS :

a. The simplest access method is sequential access. Information in the file is

processed in order, one record after the other. This mode of access is by far the most common; for example, editors and compilers usually access files in this fashion.

b. Reads and writes make up the bulk of the operations on a file. A read operation—read next()—reads the next portion of the file and automatically advances a file pointer, which tracks the I/O location. Similarly, the write operation—write next()—appends to the end of the file and advances to the end of the newly written material.

DIRECT ACCESS :

- Another method is direct access (or relative access). Here, a file is made up of fixed-length logical records that allow programs to read and write records rapidly in no particular order.
- The direct- access method is based on a disk model of a file, since disks allow random access to any file block. For direct access, the file is viewed as a numbered sequence of blocks or records. Thus, wemayreadblock14,then read block53,and then write block7 .There are no restrictions on the order of reading or writing for a direct-access file.
- A relative block number is an index relative to the beginning of the file. Thus, the first relative block of the file is 0, the next is 1, and so on, even though the absolute disk address may be 14703 for the first block and 3192 for the second. The use of relative block numbers allows the operating system to decide where the file should be placed.

21. Mention the purpose of indexed allocation (Pg No : 559)[L2]

a. **Linked scheme**. An index block is normally one disk block. Thus, it can be read and written directly by itself. To allow for large files, we can link together several index blocks.

b. **Multilevel index**. A variant of linked representation uses a first-level index blocktopointtoasetofsecondlevelindexblocks,whichinturnpointtothefileblocks.

This approach could be continued to a third or fourth level, depending on the desired maximum file size. With 4,096-byte blocks, we could store 1,024 four-byte pointers in an index block. Two levels of indexes allow 1,048,576 data blocks and a file size of up to 4 GB.

c. **Combined scheme**. Another alternative, used in UNIX-based file systems, is to keep the first, say, 15 pointers of the index block in the file's inode.

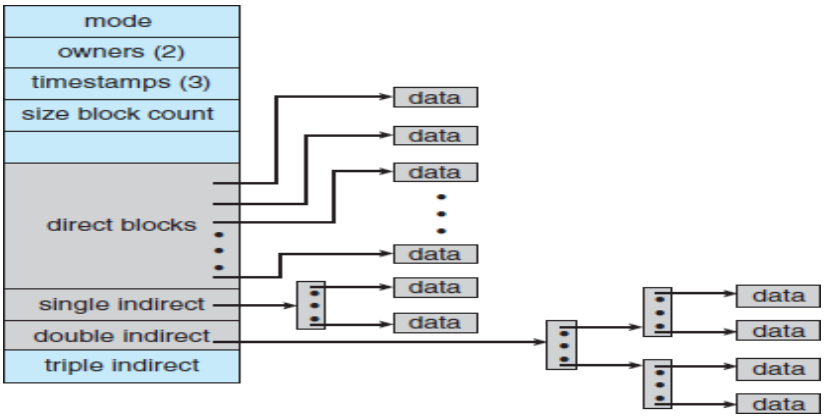
d. The first 12 of these pointers point to **direct blocks**; that is, they contain addresses of blocks that contain data of the file. Thus, the data for small files (of no more than 12 blocks) do not need a separate index block.

e. If the block size is 4 KB, then up to 48 KB of data can be accessed directly. The next three pointers point to **indirect blocks**. The first points to a **single indirect block**, which is an index block containing not data but the addresses of blocks that do contain data.

f. The second points to a **double indirect block**, which contains the address

of a block that contains the addresses of blocks that contain pointers to the actual data blocks. The last pointer contains the address of a **triple in direct block**.

22.Draw the performance matrices of file system implementation in operating system. (Pg No : 560-561)(L2)



23.State how access control in protection of file system works?.(Pg No : 534-538)[L2]

a. Different users may need different types of access to a file or directory. The most general scheme to implement identity dependent access is to associate with each file and directory an **access-control list (ACL)** specifying user names and the types of access allowed for each user.
b. **Owner**. The user who created the file is the owner.
c. **Group**. A set of users who are sharing the file and need similar access is a group, or work group.
d. **Universe**. All other users in the system constitute the universe

PART C

12 MARKS:

1. What is magnetic disk and explain in brief about solid state disk and magnetic disk with pictorial representation. (Pg No : 467-470)[L1]
2. Elucidate in detail about all five types of disk scheduling (Pg No : 472-478)[L1]
3. Give a brief note on file concepts which says about file attribute , types and operation . scheduling (PgNo : 503-511) [L2]
4. Explain in detail about file structure (Pg No : 511-513)[L1]
5. What is file access method and give a note on all kinds of it. (Pg No : 513-515)[L1]
6. Describe in detail about file sharing (Pg No : 528-533)[L1]
7. Depict in detail about all three types of file allocation methods (Pg No : 553-560)[L1]
8. Elaborate the low level task on OS (swap space management) (Pg No : 482-484)[L2]
9. Give the brief note on storage management in operating system (Pg No : 467-470)[L2]
10. Compare and contrast the contiguous allocation and linked allocation (Pg No : 553-557)(L2)

**********END**********

SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
Department Of Computer Science and Engineering
18CSC205J_OPERATING SYSTEMS: CT3
(Total : 100 Marks) Time : 90 minutes

Part A (30*1=30) : Max Time : 30 minutes

1)During execution of a program if program references a page that is not available in main memory, it is called

A. Demand Paging
B. Frame Fault
C. page fault
D. processor fault

2) _____has ability to mark an entry invalid through a valid–invalid bit or a special value of protection bits

A.Secondary memory
B.Swap Device
C.Page Table
D.None of the above

3) Below are the advantages of _____

i. Large virtual memory.
ii. More efficient use of memory.
iii. There is no limit on degree of multiprogramming.

A.Demand Paging
B.Virtual Memory
C.Page Fault
D.None of the above

4) Consider the following sequence of addresses : 123,215,600,1234,76,96. If page size is 100, then the reference string is?
A. 1,2,6,12
B. 12,21,60,123,7,9
C. 1,2,6,12,0,0
D. 0,2,6,12,0,0

5)Where does the Swap Space exists?
A. Primary Memory
B. secondary memory
C. virtual memory
D. CPU

6)If a process is spending more time paging than executing, then it is called
A.Thrashing
B.Page Fault
C.Processor Fault
D.Frame Fault

7) Effective access time is directly proportional to _____
a) page-fault rate
b) hit ratio
c) memory access time
d) none of the mentioned

8)In page replacement the working set model is based on assumption of_____
a) modularity
b) locality
c) globalization
d) random access

9) Consider a disk queue with requests for I/O to blocks on cylinders.
98 183 37 122 14 124 65 67. Considering FCFS (first cum first served) scheduling, the total number of head movements is, if the disk head is initially at 53 is?
a) 600
b) 620
c) 630
d) 640

10) Consider a disk queue with requests for I/O to blocks on cylinders.
98 183 37 122 14 124 65 67.Considering SSTF (shortest seek time first) scheduling, the total number of head movements is, if the disk head is initially at 53 is?
a) 224
b) 236
c) 245
d) 240

11) In the _____ algorithm, the disk arm goes as far as the final request in each direction, then reverses direction immediately without going to the end of the disk.
a) LOOK
b) SCAN
c) C-SCAN
d) C-LOOK

12) Total head movements in FCFS is _____ ; SSTF is ____

A.632,232
B.234,286
C.331,234
D.232,632

13) The two main aspects of Virtual memory is _____
A. Frame allocation and Page Replacement
B.Page Fault and Thrashing
C.Thrashing and Frame allocation
D.None of the above

14) The algorithm replaces the page which will not be referred for so long in future. This is ____
A. Optimal Page Replacement algorithm
B.LRU
C.FIFO
D.None of the above

15) The time taken to locate the disk arm to a specified track where the data is to be read or write.
A.Seek Time
B.Transfer Time
C.Disk Access Time
D.None of the Above

16)Local network that uses fibre channel to connect several data storage devices
A.Storage Area Network
B.Network attached Storage
C.Both A and B
D.None of the above

17) For systems that place a heavy load on the disk which algorithm can be selected?
A.SSTF
B.SCAN
C.C-SCAN
D.Both B and C

18) _____ is series or collection of bits where each bit corresponds to a disk block.
A.Bit Map
B.Bit Block
C.Worksheet
D.None of the above

19) _____allows both parent and child processes to initially share the same pages in memory
A.fork
B. Copy-on-Write
C.Demand Paging
D.None of the above

20)_____ works based on Locality of Reference
A. Working – set Model
B.Page Fault Frequency Model
C.Thrashing
D.None of the above

21) Dividing a disk into sectors that the disk controller can read and write is _____
A. Low-level formatting
B. Logical formatting
C. Partition
D.None of the above

22) In file attributes, only information stored in a human-readable form is _____
A.Identifier
B.Name
C. Location
D. Protection.

23) _____allows a user to transfer files without having an account on the remote system.
A. Anonymous access
B.Read access
C.Write access
D.None of the above

24) _____represent an important criterion for evaluating any file system that supports file sharing
A. Consistency semantics
B.File Sharing
C.Remote file systems
D. None of the above

25) Disk Access Time is calculated by_____
A. Seek time + Rotational latency + Transfer time
B. Seek time +Rotational latency
C. Seek time + Transfer time
D.None of the above

26. _____is used to handle bad blocks
A.Boot strap loader
B.Sector sparing
C.Raw disk
D.None of the above

27) Bitmap or Bit vector can take two values 0 and 1: ____ indicates a free block and ____ indicates that the block is allocated

A.0,1

B.1,0

28)_____ provide a common interface to multiple different file system types

A. Virtual File Systems

B.Directory

C.Hashtable

D.None of the above

29)Consider a main memory with five page frames and the following sequence of page references: 3, 8, 2, 3, 9, 1, 6, 3, 8, 9, 3, 6, 2, 1, 3. which one of the following is true with respect to page replacement policies First-In-First-out (FIFO) and Least Recently Used (LRU)?

A. Both incur the same number of page faults

B. FIFO incurs 2 more page faults than LRU

C. LRU incurs 2 more page faults than FIFO

D. FIFO incurs 1 more page faults than LRU

30)_____ stores the address of the free blocks in the first free block

A.Linked List

B.Grouping

C.Counting

D.None of the above

Part B (35*2=70) : Max Time : 60 minutes

1)Consider a system having 64 frames and there are 4 process with the following virtual memory sizes: V(1)=16, V(2)=128,V(3)=64,V(4)=48. The number of frames for each process using Equal allocation and Proportional allocation

A.16,256

B.12,124

C.256,24

D.12,16

2) Consider a disk queue with request for input/output to block on cylinders 98, 183, 37, 122, 14, 124, 65, 67in that order. Assume that disk head is initially positioned at cylinder 53 and moving towards cylinder number 0. The total number of head movements using Shortest Seek Time First (SSTF) and SCAN algorithms are respectively

A.236 and 252 cylinders

B.640 and 236 cylinders

C.235 and 640 cylinders

D.None of the above

3) On a disk with 1000 cylinders (0 to 999) find the number of tracks, the disk arm must move to satisfy all the requests in the disk queue. Assume the last request service was at track 345 and the head is moving toward track 0. The queue in FIFO order contains requests for the following tracks :123, 874, 692, 475, 105, 376(Assume SCAN algorithm)

A.2013
B.1219
C.1967
D.1507

4) Assuming that the disk head is located initially at 32, find the number of disk moves required with FCFS if the disk queue of I/O block requests are 98, 37, 14, 124, 65, 67 :

A.310
B.324
C.320
D.321

5) Which of the following statements is not true about disk-arm scheduling algorithms ?
A.SSTF (shortest seek time first) algorithm increases performance of FCFS.
B.The number of requests for disk service are not influenced by file allocation method.
C.Caching the directories and index blocks in main memory can also help in reducing disk arm movements.
D.SCAN and C-SCAN algorithms are less likely to have a starvation problem.

6) If the disk head is located initially at 32, find the number of disk moves required with FCFS if the disk queue of I/O blocks requests are 98, 37, 14, 124, 65, 67.

A.239
B.310
C.321
D.325

7.Consider the following page reference string: 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1. calculate the total number of page faults when allocated page blocks are 3

A.9
B.19
C.10
D.11

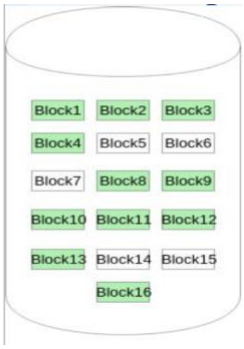
8. Consider a reference string: 4, 7, 6, 1, 7, 6, 1, 2, 7, 2. the number of frames in the memory is 3. the number of page faults respective to Optimal Page Replacement Algorithm & c. LRU Page Replacement Algorithm is

A.5,6
B.6,5
C.7,5
D.5,7

9. Consider the following disk request sequence for a disk with 100 tracks. 98, 137, 122, 183, 14, 133, 65, 78.Head pointer starting at 54 and moving in left direction. The number of head movements in cylinders using SCAN & C-SCAN scheduling.

A.237,387
B.387,237
C.257,357
D.None of the above

10. The given instance of disk blocks as below. (where green blocks are allocated) can be represented by a bitmap as



A. 0000111000000110
B. 0000111000000010
C. 0001111000000110
D. 0000111001011110

11. A CPU generates 32-bit virtual address. The page size is 4 KB. The processor has a TLB which can hold a total of 128 page table entries and is a 4 way set associative. The minimum size of TLB tag is

A.11 bits
B.13 Bits
C.15 bits
D.20 bits

12.Match the following and select the appropriate answer

Disk Scheduling Algorithm	Process Description
i)FCFS	a)selects the request with the minimum seek time from the current head position.the request near the disk arm will get executed first.
ii)SCAN	b)The head moves from one end of the disk to the other, servicing requests as it goes– When it reaches the other end, however, it immediately returns to the beginning of the disk, without servicing any requests on the return trip
iii)C-SCAN	c)The disk arm starts at one end of the disk, and moves toward the other end, servicing requests until it gets to the other end of the disk, where the head movement is reversed and servicing continues
iv)SSTF	d)The requests are addressed in the order they arrive in the disk queue.

A.i)-d ; ii)-c;iii)-b;iv)a
B.i)-d ; ii)-c;iii)-a;iv)b
C.i)-b ; ii)-c;iii)-a;iv)d
D.i)-b ; ii)-a;iii)-c;iv)d

13) In Unix File Permission, -rwxr-xr-- represents that the owner has_____-rwxr-xr-- represents that the group has_____

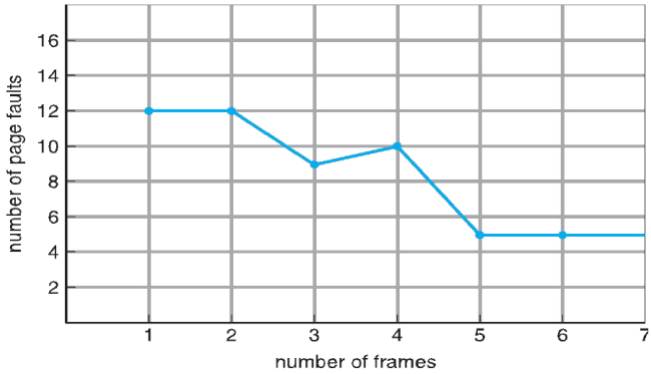
A. read (r), write (w) and execute (x) permission; read (r) and execute (x) permission, but no write permission
B. read (r) and execute (x) permission, but no write permission; read (r), write (w) and execute (x) permission
C. read (r) only permission; read (r), write (w) and execute (x) permission
D.None of the above

14) VFS in Linux is based upon four key object types. Match appropriately.

Key Object types	Process Description
i)inode	a)representing a directory entry.
ii)file	b)representing a filesystem
iii)superblock	c)representing an individual file
iv)dentry	d)representing an open file

A.i)-c ; ii)-d;iii)-b;iv)a
B.i)-d ; ii)-c;iii)-a;iv)b
C.i)-b ; ii)-c;iii)-a;iv)d
D.i)-b ; ii)-a;iii)-c;iv)d

15) What does the below graph indicate? What does it infer?



A. FIFO Page replacement Algorithm; if number of page frames increases page fault also increases
B. Belady's Anomaly; if number of page frames increases page fault also increases
C. FIFO Page replacement Algorithm; if number of page frames decreases page fault increases
D. Belady's Anomaly ; if number of page frames decreases page fault increases

16. Order of request is- (82,170,43,140,24,16,190) and current position of Read/Write head is : 50 total seek time using FCFS and SSTF is

A.642; 208
B.208;642
C.332;208
D.332;642

17)Which of the below statement about Acyclic graph directory is correct

i) is a graph with no cycle and allows to share subdirectories and files

ii) Searching is easy due to different-different paths

iii) when two programmers are working on a joint project and they need to access files. In this situation acyclic graph can be used.

iv) In acyclic graph directory cycles are allowed within a directory structure where multiple directories can be derived from more than one parent directory.

A.i,ii,ii are correct
B.ii,iii,iv are correct
C.i and iv are correct
D.All are correct

18)The first entry in the stack frame contains _____ and second entry contains _____

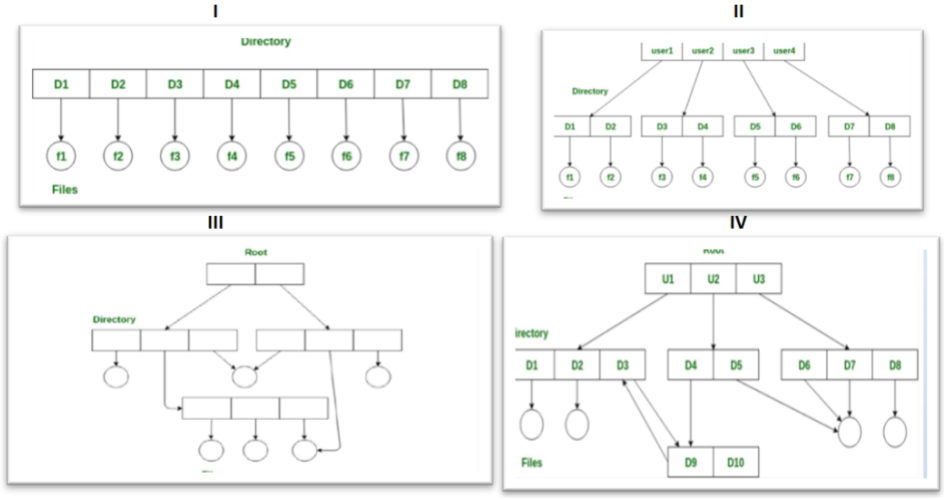
A.The previous value of the frame base; the return address of the function
B. the return address of the function; The previous value of the frame base
C. The previous value of the frame base; the next value of the frame base
D. the next value of the frame base; The previous value of the frame base

19) Match the following commands

Key Object types	Process Description
i)Chmod	a)Change group permission(For files)
ii)Chown	b)Change Mode(For files)
iii)Chgroup	c)Change Owner(For Files)

A.i)-b ; ii)-c;iii)-a
B.i)-c ; ii)-b;iii)-a
C.i)-a ; ii)-b;iii)-c
D.i)-a ; ii)-c;iii)-b

20) Identify the directory structure from the below



A. I.Single level Directory Structure;II.Two-level directory;III.Acyclic;IV.General graph directory
B. I.Acyclic;II.Two-level directory;III.Single level Directory Structure;IV.General graph directory
C. I.Acyclic;II.General graph directory;III.Single level Directory Structure;IV.Two-level directory
D. I.General graph directory;II.Acyclic;III.Single level Directory Structure;IV.Two-level directory

21) Consider a typical disk that rotates at 15000 rotations per minute (RPM) and has a transfer rate of 50 × 10^6 bytes/sec. If the average seek time of the disk is twice the average rotational delay and the controller's transfer time is 10 times the disk transfer time, the average time (in milliseconds) to read or write a 512 byte sector of the disk is _____

A.6.1
B.7.1
C.5.1
D.8.1

22) Suppose the following disk request sequence (track numbers) for a disk with 100 tracks is given: 45, 20, 90, 10, 50, 60, 80, 25, 70. Assume that the initial position of the R/W head is on track 50. The additional distance that will be traversed by the R/W head when the Shortest Seek Time First (SSTF) algorithm is used compared to the SCAN (Elevator) algorithm (assuming that SCAN algorithm moves towards 100 when it starts execution) is _____ tracks

A.8
B.9
C.10
D.11

23) Suppose a disk has 201 cylinders, numbered from 0 to 200. At some time the disk arm is at cylinder 100, and there is a queue of disk access requests for cylinders 30, 85, 90, 100, 105, 110, 135 and 145. If Shortest-Seek Time First (SSTF) is being used for scheduling the disk access, the request for cylinder 90 is serviced after servicing _____ number of requests
A.1
B.2
C.3
D.4

24) A virtual memory system uses First In First Out (FIFO) page replacement policy and allocates a fixed number of frames to a process. Consider the following statements:

P: Increasing the number of page frames allocated to a process sometimes increases the page fault rate.
Q: Some programs do not exhibit locality of reference.

Which one of the following is TRUE?
A.Both P and Q are true, and Q is the reason for P
B.Both P and Q are true, but Q is not the reason for P
C. P is false, but Q is true
D. Both P and Q are false

25) A system uses FIFO policy for page replacement. It has 4 page frames with no pages loaded to begin with. The system first accesses 100 distinct pages in some order and then accesses the same 100 pages but now in the reverse order. How many page faults will occur?
A.192
B.195
C.186
D.196

26) A process has been allocated 3 page frames. Assume that none of the pages of the process are available in the memory initially. The process makes the following sequence of page references (reference string): 1, 2, 1, 3, 7, 4, 5, 6, 3, 1.If optimal page replacement policy is used, how many page faults occur for the above reference string?
A.10
B.9
C.7
D.8

27) Consider the virtual page reference string 1, 2, 3, 2, 4, 1, 3, 2, 4, 1.On a demand paged virtual memory system running on a computer system that main memory size of 3 pages frames which are initially empty. Let FIFO and OPTIMAL denote the number of page faults under the corresponding page replacements policy. Then

A. OPTIMAL < FIFO < LRU
B. OPTIMAL < LRU < FIFO
C. OPTIMAL = LRU
D. OPTIMAL = FIFO

28) Consider a disk queue with I/O requests on the following cylinders in their arriving order:
6, 10, 12, 54, 97, 73, 128, 15, 44, 110, 34, 45 .The disk head is assumed to be at cylinder 23 and moving in the direction of decreasing number of cylinders. Total number of cylinders in the disk is 150. The disk head movement using SCAN-scheduling algorithm is:
A.172
B.173
C.151
D.228

29) Consider a virtual page reference string 1, 2, 3, 2, 4, 2, 5, 2, 3, 4. Suppose LRU page replacement algorithm is implemented with 3 page frames in main memory. Then the number of page faults are_____.

A.7
B.5
C.9
D.10

30. Consider the following page reference string :1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6
Which of the following options, gives the correct number of page faults related to LRU, FIFO, and optimal page replacement algorithms respectively, assuming 05 page frames and all frames are initially empty ?
A. 7, 10, 8
B. 10, 14, 8
C. 7, 10, 7
D. 8, 10, 7

31.Identify the statements that are true for “Global replacement”
i)Process selects a replacement frame from the set of all frames; one process can take a frame from another
ii)process execution time can vary greatly
iii)allows a high-priority process to increase its frame allocation at the expense of a low-priority process
iv)the number of frames allocated to a process does not change

A.i,ii,iii
B.ii,iii,iv
C.i,iii,iv
D.All statements are true

32) NFS is standard _____ & CIFS is standard _____
A. Windows protocol; UNIX client-server file sharing protocol
B. UNIX client-server file sharing protocol; Windows protocol
C. Windows protocol; Windows protocol
D. UNIX client-server file sharing protocol; UNIX client-server file sharing protocol

33) The action of moving a process out from main memory to secondary memory is called _____& the action of moving a process out from secondary memory to main memory is called _____
A.Swap out, Swap in
B.Swap in, Swap out
C.Counting ,Gropuing
D.Grouping, Counting

34) Are the below statement true to control Thrashing
i) If actual rate is lower than lower bound, decrease the number of frames
ii)If actual rate is larger than upper bound, increase the number of frames.
A.TRUE
B.FALSE

35) A computer system supports 32-bit virtual addresses as well as 32-bit physical addresses. Since the virtual address space is of the same size as the physical address space, the operating system designers decide to get rid of the virtual memory entirely. Which one of the following is true?
A.Efficient implementation of multi-user support is no longer possible
B. The processor cache organization can be made more efficient now
C. CPU scheduling can be made more efficient now
D. Hardware support for memory management is no longer needed

Operating Systems
Question Bank

1.What is operating system?
a) collection of programs that manages hardware resources b) system service provider to the application programs
c) link to interface the hardware and application programs d) all of the mentioned
Answer:d

2. To access the services of operating system, the interface is provided by the
a) system calls b) API c) library d) assembly instructions
Answer:a

3. Which one of the following is not true?
a) kernel is the program that constitutes the central core of the operating system
b) kernel is the first part of operating system to load into memory during booting
c) kernel is made of various modules which can not be loaded in running operating system
d) kernel remains in the memory during the entire computer session
Answer:c

4. Which one of the following error will be handle by the operating system?
a) power failure b) lack of paper in printer c) connection failure in the network d) all of the mentioned
Answer:d

5. The main function of the command interpreter is
a) to get and execute the next user-specified command
b) to provide the interface between the API and application program
c) to handle the files in operating system
d) none of the mentioned
Answer:a

6. By operating system, the resource management can be done via
a) time division multiplexing b) space division multiplexing c) both (a) and (b)
d) none of the mentioned
Answer:c

7. If a process fails, most operating system write the error information to a
a) log file b) another running process c) new file d) none of the mentioned
Answer:a

8. Which facility dynamically adds probes to a running system, both in user processes and in the kernel?
a) Dtrace b) Dlocate c) Dmap d) Dadd
Answer:a

9. Which one of the following is not a real time operating system?
a) VxWorks b) Windows CE c) RTLinux d) Palm OS
Answer:d

10. The OS X has
a) monolithic kernel
b) hybrid kernel
c) microkernel
d) monolithic kernel with modules
Answer:b

11. The systems which allows only one process execution at a time, are called
a) uniprogramming systems
b) uniprocessing systems
c) unitasking systems
d) none of the mentioned
Answer:a

12. In operating system, each process has its own
a) address space and global variables
b) open files
c) pending alarms, signals and signal handlers
d) all of the mentioned
Answer:d

13) A single thread of control allows the process to perform :
a) only one task at a time
b) multiple tasks at a time
c) All of these
Answer: a

14) The objective of multi-programming is to : (choose two)
a) Have some process running at all times
b) Have multiple programs waiting in a queue ready to run
c) To minimize CPU utilization
d) To maximize CPU utilization

Answer: a and d

15) Which of the following do not belong to queues for processes ?
a) Job Queue b) PCB queue c) Device Queue d) Ready Queue
Answer: b

16) When the process issues an I/O request :
a) It is placed in an I/O queue
b) It is placed in a waiting queue
c) It is placed in the ready queue
d) It is placed in the Job queue
Answer: a
17) What is a trap/exception ?
a) hardware generated interrupt caused by an error
b) software generated interrupt caused by an error
c) user generated interrupt caused by an error
d) None of these
Answer: b
18) What is an ISR ?
a) Information Service Request
b) Interrupt Service Request
c) Interrupt Service Routine
d) Information Service Routine
Answer: c
19) An interrupt vector
a) is an address that is indexed to an interrupt handler
b) is a unique device number that is indexed by an address
c) is a unique identity given to an interrupt
d) None of these
Answer: a
20) DMA is used for : (choose two)
a) High speed devices(disks and communications network)
b) Low speed devices
c) Saving CPU cycles
d) Utilizing CPU cycles
Answer: a and c
21) In a memory mapped input/output :
a) the CPU uses polling to watch the control bit constantly, looping to see if device is ready
b) the CPU writes one data byte to the data register and sets a bit in control register to show that a byte is available
c) the CPU receives an interrupt when the device is ready for the next byte

d) the CPU runs a user written code and does accordingly
Answer: b
22) In a programmed input/output(PIO) :
a) the CPU uses polling to watch the control bit constantly, looping to see if device is ready
b) the CPU writes one data byte to the data register and sets a bit in control register to show that a byte is available
c) the CPU receives an interrupt when the device is ready for the next byte
d) the CPU runs a user written code and does accordingly
Answer: a
23) In an interrupt driven input/output :
a) the CPU uses polling to watch the control bit constantly, looping to see if device is ready
b) the CPU writes one data byte to the data register and sets a bit in control register to show that a byte is available
c) the CPU receives an interrupt when the device is ready for the next byte
d) the CPU runs a user written code and does accordingly
Answer: c
24) In the layered approach of Operating Systems : (choose two)
a) Bottom Layer(0) is the User interface
b) Highest Layer(N) is the User interface
c) Bottom Layer(0) is the hardware
d) Highest Layer(N) is the hardware
Answer: b and c
25) How does the Hardware trigger an interrupt ?
a) Sending signals to CPU through system bus
b) Executing a special program called interrupt program
c) Executing a special program called system program
d) Executing a special operation called system call
Answer: a
26) Which operation is performed by an interrupt handler ?
a) Saving the current state of the system
b) Loading the interrupt handling code and executing it
c) Once done handling, bringing back the system to the original state it was before the interrupt occurred
d) All of these
Answer: d
27. Which module gives control of the CPU to the process selected by the short-term scheduler?
a) dispatcher b) interrupt c) scheduler d) none of the mentioned
Answer:a
28. The processes that are residing in main memory and are ready and waiting to execute are kept on a list called
a) job queue b) ready queue c) execution queue d) process queue

Answer:b
29. The interval from the time of submission of a process to the time of completion is termed as
a) waiting time b) turnaround time c) response time d) throughput
Answer:b
30. Which scheduling algorithm allocates the CPU first to the process that requests the CPU first?
a) first-come, first-served scheduling b) shortest job scheduling c) priority scheduling
d) none of the mentioned
Answer:a
31. In priority scheduling algorithm
a) CPU is allocated to the process with highest priority b) CPU is allocated to the process with lowest priority
c) equal priority processes can not be scheduled d) none of the mentioned
Answer:a
32. In priority scheduling algorithm, when a process arrives at the ready queue, its priority is compared with the priority of
a) all process b) currently running process c) parent process d) init process
Answer:b
33. Time quantum is defined in
a) shortest job scheduling algorithm b) round robin scheduling algorithm
c) priority scheduling algorithm d) multilevel queue scheduling algorithm
Answer:b
34. Process are classified into different groups in
a) shortest job scheduling algorithm b) round robin scheduling algorithm
c) priority scheduling algorithm d) multilevel queue scheduling algorithm
Answer:d
35. In multilevel feedback scheduling algorithm
a) a process can move to a different classified ready queue
b) classification of ready queue is permanent
c) processes are not classified into groups
d) none of the mentioned
Answer:a
36. Which one of the following can not be scheduled by the kernel?
a) kernel level thread
b) user level thread
c) process
d) none of the mentioned
Answer:b.
37) CPU scheduling is the basis of _____.
a) multiprocessor systems b) multiprogramming operating systems
c) larger memory sized systems d) None of these

Answer: b
38) With multiprogramming, _____ is used productively.
a) time b) space c) money d) All of these
Answer: a
39) The two steps of a process execution are : (choose two)
a) I/O Burst b) CPU Burst c) Memory Burst d) OS Burst
Answer: a and b
40) An I/O bound program will typically have :
a) a few very short CPU bursts b) many very short I/O bursts
c) many very short CPU bursts d) a few very short I/O bursts
Answer: c
41) A process is selected from the _____ queue by the _____ scheduler, to be executed.
a) blocked, short term b) wait, long term c) ready, short term d) ready, long term
Answer: c
42) In the following cases non – preemptive scheduling occurs : (Choose two)
a) When a process switches from the running state to the ready state
b) When a process goes from the running state to the waiting state
c) When a process switches from the waiting state to the ready state
d) When a process terminates
Answer: b and d
43) The switching of the CPU from one process or thread to another is called :
a) process switch b) task switch c) context switch
d) All of these
Answer: d
44) Dispatch latency is :
a) the speed of dispatching a process from running to the ready state
b) the time of dispatching a process from running to ready state and keeping the CPU idle
c) the time to stop one process and start running another one
d) None of these
Answer: c

45. In Unix, Which system call creates the new process?
a) fork
b) create
c) new
d) none of the mentioned
Answer:a

46. A process can be terminated due to
a) normal exit
b) fatal error

c) killed by another process
d) all of the mentioned
Answer:d
47. What is the ready state of a process?
a) when process is scheduled to run after some execution
b) when process is unable to run until some task has been completed
c) when process is using the CPU
d) none of the mentioned
Answer:a
Explanation:When process is unable to run until some task has been completed, the process is in blocked state and if process is using the CPU, it is in running state.
48. What is interprocess communication?
a) communication within the process
b) communication between two process
c) communication between two threads of same process
d) none of the mentioned
Answer:b
49. A set of processes is deadlock if
a) each process is blocked and will remain so forever
b) each process is terminated
c) all processes are trying to kill each other
d) none of the mentioned
Answer:a
50. A process stack does not contain
a) function parameters
b) local variables
c) return addresses
d) PID of child process
Answer:d
51. Which system call returns the process identifier of a terminated child?
a) wait
b) exit
c) fork
d) get
Answer:a

52) A Process Control Block(PCB) does not contain which of the following :
a) Code
b) Stack
c) Heap
d) Data

e) Program Counter
f) Process State
g) I/O status information
h) bootstrap program
Answer: h
53) The number of processes completed per unit time is known as _____.
a) Output b) Throughput c) Efficiency d) Capacity
Answer: b
54) The state of a process is defined by :
a) the final activity of the process
b) the activity just executed by the process
c) the activity to next be executed by the process
d) the current activity of the process
Answer: d
55) Which of the following is not the state of a process ?
a) New b) Old c) Waiting d) Running e) Ready f) Terminated
Answer: b
56) The Process Control Block is :
a) Process type variable
b) Data Structure
c) a secondary storage section
d) a Block in memory
Answer: b
57) The entry of all the PCBs of the current processes is in :
a) Process Register b) Program Counter c) Process Table d) Process Unit
Answer: c
58) The degree of multi-programming is :
a) the number of processes executed per unit time
b) the number of processes in the ready queue
c) the number of processes in the I/O queue
d) the number of processes in memory
Answer: d

59) When a process terminates : (Choose Two)
a) It is removed from all queues
b) It is removed from all, but the job queue
c) Its process control block is de-allocated
d) Its process control block is never de-allocated
Answer: a and c

60) What is a long-term scheduler ?

a) It selects which process has to be brought into the ready queue
b) It selects which process has to be executed next and allocates CPU
c) It selects which process to remove from memory by swapping
d) None of these
Answer: a
61) If all processes I/O bound, the ready queue will almost always be _____, and the Short term Scheduler will have a _____ to do.
a) full,little b) full,lot c) empty,little d) empty,lot
Answer: c
62) What is a medium-term scheduler ?
a) It selects which process has to be brought into the ready queue
b) It selects which process has to be executed next and allocates CPU
c) It selects which process to remove from memory by swapping
d) None of these
63) There are 10 different processes running on a workstation. Idle processes are waiting for an input event in the input queue. Busy processes are scheduled with the Round-Robin timesharing method. Which out of the following quantum times is the best value for small response times, if the processes have a short runtime, e.g. less than 10ms ?
a) tQ = 15ms
b) tQ = 40ms
c) tQ = 45ms
d) tQ = 50ms
View Answer
Answer: a
Explanation: None.
64) Orders are processed in the sequence they arrive if _____ rule sequences the jobs.
a) earliest due date
b) slack time remaining
c) first come, first served
d) critical ratio
View Answer
Answer: c
Explanation: None.
65) Which of the following algorithms tends to minimize the process flow time ?
a) First come First served
b) Shortest Job First
c) Earliest Deadline First
d) Longest Job First
View Answer
Answer: b
Explanation: None.

66) Under multiprogramming, turnaround time for short jobs is usually _____ and that for long jobs is slightly _____.
a) Lengthened; Shortened
b) Shortened; Lengthened
c) Shortened; Shortened
d) Shortened; Unchanged
View Answer
Answer: b
Explanation: None.
67) Which of the following statements are true ? (GATE 2010)
I. Shortest remaining time first scheduling may cause starvation
II. Preemptive scheduling may cause starvation
III. Round robin is better than FCFS in terms of response time
a) I only
b) I and III only
c) II and III only
d) I, II and III
View Answer
Answer: d
Explanation:
I) Shortest remaining time first scheduling is a preemptive version of shortest job scheduling. It may cause starvation as shorter processes may keep coming and a long CPU burst process never gets CPU.
II) Preemption may cause starvation. If priority based scheduling with preemption is used, then a low priority process may never get CPU.
III) Round Robin Scheduling improves response time as all processes get CPU after a specified time
ting System

68) The most optimal scheduling algorithm is :
a) FCFS – First come First served
b) SJF – Shortest Job First
c) RR – Round Robin
d) None of these
View Answer
Answer: b
Explanation: None.
69) The real difficulty with SJF in short term scheduling is :
a) it is too good an algorithm
b) knowing the length of the next CPU request
c) it is too complex to understand
d) None of these
View Answer

Answer: b
Explanation: None.
70) The FCFS algorithm is particularly troublesome for _____.
a) time sharing systems
b) multiprogramming systems
c) multiprocessor systems
d) Operating systems
View Answer
Answer: b
Explanation: In a time sharing system, each user needs to get a share of the CPU atregular intervals.
71) Consider the following set of processes, the length of the CPU burst time given in milliseconds :
Process Burst time
P1 6
P2 8
P3 7
P4 3
i) Assuming the above process being scheduled with the SJF scheduling algorithm :
a) The waiting time for process P1 is 3ms.
b) The waiting time for process P1 is 0ms.
c) The waiting time for process P1 is 16ms.
d) The waiting time for process P1 is 9ms.
View Answer
Answer: a
Explanation: None.
ii) Assuming the above process being scheduled with the SJF scheduling algorithm :
a) The waiting time for process P2 is 3ms.
b) The waiting time for process P2 is 0ms.
c) The waiting time for process P2 is 16ms.
d) The waiting time for process P2 is 9ms.
View Answer
Answer: c
Explanation: None.
iii) Assuming the above process being scheduled with the SJF scheduling algorithm :
a) The waiting time for process P4 is 3ms.
b) The waiting time for process P4 is 0ms.
c) The waiting time for process P4 is 16ms.
d) The waiting time for process P4 is 9ms.
View Answer
Answer: b
Explanation: None.

iv) Assuming the above process being scheduled with the SJF scheduling algorithm :
a) The waiting time for process P3 is 3ms.
b) The waiting time for process P3 is 0ms.
c) The waiting time for process P3 is 16ms.
d) The waiting time for process P3 is 9ms.
View Answer
Answer: d
Explanation: None.
72) Preemptive Shortest Job First scheduling is sometimes called :
a) Fast SJF scheduling
b) EDF scheduling – Earliest Deadline First
c) HRRN scheduling – Highest Response Ratio Next
d) SRTN scheduling – Shortest Remaining Time Next
View Answer
Answer: d
Explanation: None.
73) An SJF algorithm is simply a priority algorithm where the priority is :
a) the predicted next CPU burst
b) the inverse of the predicted next CPU burst
c) the current CPU burst
d) anything the user wants
View Answer
Answer: a
Explanation: The larger the CPU burst, the lower the priority.
74) One of the disadvantages of the priority scheduling algorithm is that :
a) it schedules in a very complex manner
b) its scheduling takes up a lot of time
c) it can lead to some low priority process waiting indefinitely for the CPU
d) None of these
View Answer
Answer: c
Explanation: None.
75) ‘Aging’ is :
a) keeping track of cache contents
b) keeping track of what pages are currently residing in memory
c) keeping track of how many times a given page is referenced
d) increasing the priority of jobs to ensure termination in a finite time
View Answer
Answer: d
Explanation: None.

76) A solution to the problem of indefinite blockage of low – priority processes is :
a) Starvation
b) Wait queue
c) Ready queue
d) Aging
View Answer
Answer: d
Explanation: None.
77) Which of the following statements are true ? (GATE 2010)
i) Shortest remaining time first scheduling may cause starvation
ii) Preemptive scheduling may cause starvation
iii) Round robin is better than FCFS in terns of response time
a) i only
b) i and iii only
c) ii and iii only
d) i, ii and iii
View Answer
Answer: d
Explanation: None.
78) Which of the following scheduling algorithms gives minimum average waiting time ?
a) FCFS
b) SJF
c) Round – robin
d) Priority
View Answer
Answer: b
Answer: c
79) What is a short-term scheduler ?
a) It selects which process has to be brought into the ready queue
b) It selects which process has to be executed next and allocates CPU
c) It selects which process to remove from memory by swapping
d) None of these
Answer: b
80) The primary distinction between the short term scheduler and the long term scheduler is :
a) The length of their queues
b) The type of processes they schedule
c) The frequency of their execution
d) None of these
Answer: c
81) The only state transition that is initiated by the user process itself is :
a) block

b) wakeup
c) dispatch
d) None of these
Answer: a
82) In a time-sharing operating system, when the time slot given to a process is completed, the process goes from the running state to the :
a) Blocked state
b) Ready state
c) Suspended state
d) Terminated state
Answer: b
83) In a multi-programming environment :
a) the processor executes more than one process at a time
b) the programs are developed by more than one person
c) more than one process resides in the memory
d) a single user can execute many programs at the same time
Answer: c
84) Suppose that a process is in “Blocked” state waiting for some I/O service. When the service is completed, it goes to the :
a) Running state
b) Ready state
c) Suspended state
d) Terminated state
Answer: b

85) The context of a process in the PCB of a process does not contain :
a) the value of the CPU registers
b) the process state
c) memory-management information
d) context switch time
Answer: d
86) Which of the following need not necessarily be saved on a context switch betweenprocesses ? (GATE CS 2000)
a) General purpose registers
b) Translation look-aside buffer
c) Program counter
d) All of these
Answer: b
87) Which of the following does not interrupt a running process ? (GATE CS 2001)
a) A device
b) Timer

c) Scheduler process
d) Power failure
Answer: c
88) Several processes access and manipulate the same data concurrently and the outcome of the execution depends on the particular order in which the access takes place, is called a(n) ____.
a) Shared Memory Segments
b) Entry Section
c) Race condition
d) Process Synchronization
Answer: c
89) Which of the following state transitions is not possible ?
a) blocked to running
b) ready to running
c) blocked to ready
d) running to blocked
Answer: a
90. Which process can be affected by other processes executing in the system?
a) cooperating process
b) child process
c) parent process
d) init process
Answer:a
91. When several processes access the same data concurrently and the outcome of the execution depends on the particular order in which the access takes place, is called
a) dynamic condition
b) race condition
c) essential condition
d) critical condition
Answer:b
92. If a process is executing in its critical section, then no other processes can be executing in their critical section. This condition is called
a) mutual exclusion
b) critical exclusion
c) synchronous exclusion
d) asynchronous exclusion
Answer:a
93. Which one of the following is a synchronization tool?
a) thread
b) pipe
c) semaphore
d) socket

Answer:c

94. A semaphore is a shared integer variable

a) that can not drop below zero

b) that can not be more than zero

c) that can not drop below one

d) that can not be more than one

Answer:a

95. A section of code within a process that requires access to shared resources and that may not be executed while another process in a corresponding section of code is called

a) **Critical section** b) Deadlock c) Livelock d) Mutual Exclusion

96. A situation in which two or more processes are unable to proceed because each is waiting for one of the others to do something

a) Critical section **b) Deadlock** c) Livelock d) Mutual Exclusion

97. A situation in which 2 or more processes continuously change their state in response to the changes their state in response to the changes in the other process without doing any useful work is called

a) Critical section b) Deadlock **c) Livelock** d) Mutual Exclusion

98. The requirement that when one process is in the critical section that accesses shared resources , no other process may be in a critical section that accesses any of these shared resources is called

a) Critical section b) Deadlock c) Livelock **d) Mutual Exclusion**

99. The condition in which multiple threads or processes read and write a shared data item and the final result depending on the relative timing of the execution is called

a) Critical section b) Deadlock **c) Race condition** d) starvation

100. A situation in which a runnable process is overlooked indefinitely by the scheduler;although it is able to proceed,it is never chosen is called

a) Critical section b) Deadlock c) Race condition **d) starvation**

101. There are _____ requirements for mutual exclusion.

a)6 b)7 c)5 d) 8

102. The hardware approaches to mutual exclusion are

a) Interrupt disabling b) Test and Set instruction c) Exchange instruction **d)All of these**

103. The various properties of machine –instruction approach are

a) Busy waiting b) Starvation c) Deadlock **d)All of these**

104. Semaphore is a variable that has an integer value upon which only ____ operations are defined.
a)1 b)2 **c)3** d)4

105. Binary Semaphore is also known as
a) **Mutex** b)counting semaphore c)general semaphore d)none of these

106. Binary Semaphore takes values 0 and 1 and can be defined by _____ operations.
a)1 b)2 **c)3** d)4

107. Non-binary semaphore is also known as
a) Mutex b)counting semaphore c)general semaphore **d)both**

108. The process that has been blocked the longest and is released first from the queue is a _____ semaphore.
a)weak **b)strong** c)counting d)general

109. A semaphore that does not specify order in which processes are removed from the queue is a _____ semaphore.
a)weak b)strong c)counting d)general

110. Which of these is not a combination implemented in synchronization?
a) Blocking send, blocking receive
b) Non-blocking send, blocking receive
c) Non-blocking receive ,blocking send
d) Non-blocking send, non-blocking receive

111. _____ Relationship allows private communications link to be set up between 2 processes.
a) **One to one** b)Many to one c)One to many d)Many to many

112. _____ Relationship is useful for client/server interaction.
a) One to one **b)Many to one** c)One to many d)Many to many

113. _____ Relationship allows for one sender and multiple receivers.
a) One to one b)Many to one **c)One to many** d)Many to many

114. _____ relationship allows multiple server processes to provide concurrent service to multiple clients.

a) One to one b)Many to one c)One to many d)**Many to many**

115. There are _____conditions for readers-writers problem.

a)1 b)2 **c)3** d)4

116. Which of the following is not a condition for deadlock?

a)Mutual exclusion b)Hold and wait **c)preemption** d)circular wait

117. Mutual exclusion can be provided by the
a) mutex locks
b) binary semaphores
c) both (a) and (b)
d) none of the mentioned
Answer:c
Explanation:Binary Semaphores are known as mutex locks.

118.. When high priority task is indirectly preempted by medium priority task effectively inverting the relative priority of the two tasks, the scenario is called
a) priority inversion
b) priority removal
c) priority exchange
d) priority modification
Answer:a

119. Process synchronization can be done on
a) hardware level
b) software level
c) both (a) and (b)
d) none of the mentioned
Answer:c

120. A monitor is a module that encapsulates
a) shared data structures
b) procedures that operate on shared data structure
c) synchronization between concurrent procedure invocation
d) all of the mentioned
Answer:d

121. To enable a process to wait within the monitor,
a) a condition variable must be declared as condition
b) condition variables must be used as boolean objects
c) semaphore must be used
d) all of the mentioned
Answer:a
122) Restricting the child process to a subset of the parent's resources prevents any process from :
a) overloading the system by using a lot of secondary storage
b) under-loading the system by very less CPU utilization
c) overloading the system by creating a lot of sub-processes
d) crashing the system by utilizing multiple resources
Answer: c
123) A parent process calling _____ system call will be suspended until children processes terminate.
a) wait b) fork c) exit d) exec
Answer: a

124) Cascading termination refers to termination of all child processes before the parent terminates _____.
a) Normally b) Abnormally c) Normally or abnormally d) None of these
Answer: a

125) With ……. only one process can execute at a time; meanwhile all other process are waiting for the processor. With …….. more than one process can be running simultaneously each on a different processor.
a) Multiprocessing, Multiprogramming b) Multiprogramming, Uniprocessing c) Multiprogramming, Multiprocessing
d) Uniprogramming, Multiprocessing
Answer: d

126) In UNIX, each process is identified by its :
a) Process Control Block b) Device Queue c) Process Identifier d) None of these
Answer: c

127) In UNIX, the return value for the fork system call is _____ for the child process and _____ for the parent process.
a) A Negative integer, Zero b) Zero, A Negative integer
c) Zero, A nonzero integer d) A nonzero integer, Zero
Answer: c

128) The child process can : (choose two)
a) be a duplicate of the parent process b) never be a duplicate of the parent process

c) have another program loaded into it d) never have another program loaded into it
Answer: a and c

129) The child process completes execution,but the parent keeps executing, then the child process is known as :
a) Orphanb) Zombiec) Bodyd) DeadAnswer: b
130) Remote Procedure Calls are used :
a) for communication between two processes remotely different from each other on the same system
b) for communication between two processes on the same system
c) for communication between two processes on separate systems
d) None of these Answer: c

131) To differentiate the many network services a system supports _____ are used.
a) Variables b) Sockets c) Ports d) Service names
Answer: c

132) RPC provides a(an) _____ on the client side, a separate one for each remote procedure.
a) stub b) identifier c) named) process identifier
Answer: a
133) The stub :
a) transmits the message to the server where the server side stub receives the message and invokes procedure on the server side
b) packs the parameters into a form transmittable over the network
c) locates the port on the server
d) All of these
Answer: d
134) To resolve the problem of data representation on different systems RPCs define _____.
a) machine dependent representation of data
b) machine representation of data
c) machine-independent representation of data
d) None of these
Answer: c

135) The full form of RMI :
a) Remote Memory Installation
b) Remote Memory Invocation
c) Remote Method Installation
d) Remote Method Invocation
Answer: d
136) The remote method invocation :
a) allows a process to invoke memory on a remote object

b) allows a thread to invoke a method on a remote object
c) allows a thread to invoke memory on a remote object
d) allows a process to invoke a method on a remote object
Answer: b
137) A process that is based on IPC mechanism which executes on different systems and can communicate with other processes using message based communication, is called _____.
a) Local Procedure Call
b) Inter Process Communication
c) Remote Procedure Call
d) Remote Machine Invocation
Answer: c

138) The initial program that is run when the computer is powered up is called :
a) boot program
b) bootloader
c) initializer
d) bootstrap program
Answer: d

139) How does the software trigger an interrupt ?
a) Sending signals to CPU through bus
b) Executing a special operation called system call
c) Executing a special program called system program
d) Executing a special program calle interrupt trigger program
Answer: b

140) Scheduling is done so as to :
a) increase CPU utilization b) decrease CPU utilization
c) keep the CPU more idle d) None of these
Answer: a

141) Scheduling is done so as to :
a) increase the throughput
b) decrease the throughput
c) increase the duration of a specific amount of work
d) None of these
Answer: a

142) Turnaround time is :
a) the total waiting time for a process to finish execution
b) the total time spent in the ready queue

c) the total time spent in the running queue
d) the total time from the completion till the submission of a process
Answer: d

143) Scheduling is done so as to :
a) increase the turnaround time
b) decrease the turnaround time
c) keep the turnaround time same
d) there is no relation between scheduling and turnaround time
Answer: b

144) Waiting time is :
a) the total time in the blocked and waiting queues
b) the total time spent in the ready queue
c) the total time spent in the running queue
d) the total time from the completion till the submission of a process
Answer: b

145) Scheduling is done so as to :
a) increase the waiting time
b) keep the waiting time the same
c) decrease the waiting time
d) None of these
Answer: c

146) Response time is :
a) the total time taken from the submission time till the completion time
b) the total time taken from the submission time till the first response is produced
c) the total time taken from submission time till the response is output
d) None of these
Answer: b

147) Scheduling is done so as to :
a) increase the response time
b) keep the response time the same
c) decrease the response time
d) None of these
Answer: c

148) Round robin scheduling falls under the category of :
a) Non preemptive scheduling

b) Preemptive scheduling
c) None of these
Answer: b

149) With round robin scheduling algorithm in a time shared system,
a) using very large time slices converts it into First come First served scheduling algorithm
b) using very small time slices converts it into First come First served scheduling algorithm
c) using extremely small time slices increases performance
d) using very small time slices converts it into Shortest Job First algorithm
Answer: a

150) The portion of the process scheduler in an operating system that dispatches processes is concerned with :
a) assigning ready processes to CPU
b) assigning ready processes to waiting queue
c) assigning running processes to blocked queue
d) All of these
Answer: a

151) Complex scheduling algorithms :
a) are very appropriate for very large computers
b) use minimal resources
c) use many resources
d) All of these
Answer: a

152) The FIFO algorithm :
a) first executes the job that came in last in the queue
b) first executes the job that came in first in the queue
c) first executes the job that needs minimal processor
d) first executes the job that has maximum processor needs
Answer: b

153) The strategy of making processes that are logically runnable to be temporarily suspended is called :
a) Non preemptive scheduling
b) Preemptive scheduling
c) Shortest job first
d) First come First served
Answer: b

154) What will happen if a non-recursive mutex is locked more than once ?
a) Starvation
b) Deadlock
c) Aging
d) Signaling

Answer: b

155) A semaphore :
a) is a binary mutex
b) must be accessed from only one process
c) can be accessed from multiple processes
d) None of these

Answer: c

156) The two kinds of semaphores are : (choose two)
a) mutex
b) binary
c) counting
d) decimal

Answer: b and c

157) A mutex :
a) is a binary mutex
b) must be accessed from only one process
c) can be accessed from multiple processes
d) None of these

Answer: b

158) At a particular time of computation the value of a counting semaphore is 7.Then 20 P operations and 15 V operations were completed on this semaphore.The resulting value of the semaphore is : (GATE 1987)
a) 42
b) 2
c) 7
d) 12

Answer: b

159) A binary semaphore is a semaphore with integer values : (choose two)
a) 1
b) -1
c) 0
d) 0.5

Answer: a and c

160) The following pair of processes share a common variable X :
Process A
int Y;
A1: Y = X*2;
A2: X = Y;
Process B
int Z;
B1: Z = X+1;
B2: X = Z;
X is set to 5 before either process begins execution. As usual, statements within a process are executed sequentially, but statements in process A may execute in any order with respect to statements in process B.
i) How many different values of X are possible after both processes finish executing ?
a) two
b) three
c) four
d) eight

Answer: c

161)T is set to 0 before either process begins execution and, as before, X is set to 5.
Now, how many different values of X are possible after both processes finish executing ?
a) one
b) two
c) three
d) four

Answer: a
162) Semaphores are mostly used to implement :
a) System calls
b) IPC mechanisms

c) System protection
d) None of these

Answer: b

163) Spinlocks are intended to provide _____ only.
a) Mutual Exclusion
b) Bounded Waiting
c) Aging
d) Progress
View Answer
Answer: b

UNIT-5

PART-B

1.In the …… scheme, two different parity calculations are carried out an stored in separate blocks on different disks.

a) RAID Level 4

b) RAID Level 5

c) RAID Level 6

d) RAID Level 3

Answer:c

2. Which of the following is/are the characteristics of RAID architecture.

i) RAID is set of physical disk drives viewed by the operating system as a single logical drive

ii) Data are distributed across the physical drives of an array

iii) It is used to store parity information, which guarantees data recoverability in case of disk failure.

a) i and ii only

b) ii and iii only

c) i and iiii only

d) i, ii and iii

Answer:d

3. In ……. policy, 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.

a) Last in first out

b) Shortest service time first

c) SCAN

d) Circular SCAN

Answer:d

4. When a user process issues an I/O request, the operating system assigns a buffer in the system portion of main memory to the operation is called ……..

a) Double buffer

b) Single buffer

c) Linear buffer

d) Circular buffer

Answer:b

5.If a process is executing in its critical section, then no other processes can be executing in their critical section. This condition is called

a)mutual exclusion

b)critical exclusion

c)synchronous exclusion

d)asynchronous exclusion

Answer:a

6. When high priority task is indirectly preempted by medium priority task effectively inverting the relative priority of the two tasks, the scenario is called

a)priority inversion

b)priority removal

c)priority exchange

d)priority modification

Answer:a

7. A sender S sends a message m to receiver R, which is digitally signed by S with its private key. In this scenario, one or more of the following security violations can take place. (I) S can launch a birthday attack to replace m with a fraudulent message. (II) A third party attacker can launch a birthday attack to replace m with a fraudulent message. (III) R can launch a birthday attack to replace m with a fraudulent message.

a)(I) and (II) only

b)(I) only

c)(II) only

d)(II) and (III) only

Answer:b

8.When several processes access the same data concurrently and the outcome of the execution depends on the particular order in which the access takes place, is called?

a) dynamic condition

b) race condition

c) essential condition

d) critical condition

Answer:b

9.If a process is executing in its critical section, then no other processes can be executing in their critical section. This condition is called?

a) mutual exclusion

b) critical exclusion

c) synchronous exclusion

d) asynchronous exclusion

Answer:a

10.When high priority task is indirectly preempted by medium priority task effectively inverting the relative priority of the two tasks, the scenario is called _____

a) priority inversion

b) priority removal

c) priority exchange

d) priority modification

Answer:a

11.If the swap space is simply a large file, within the file system, _____ used to create it, name it and allocate its space.

a) special routines must be

b) normal file system routines can be

c) normal file system routines cannot be

d) swap space storage manager is

Answer:b

12…….. are small fixed portions which provide greater flexibility which may require large tables or complex structures for their allocation.

a) Blocks

b) Columns

c) Segments

d) Partitions

Answer:a

13. Which of the following is/are the types of operations that may be performed on the directory.

i) Search ii) Create file iii) Create directory iv) List directory

a) i, ii and iii only

b) ii, iii and iv only

c) i, ii and iv only

d) i, ii, iii and iv

Answer:c

14. In …….. file organization, a fixed format is used for records where all records are of the same length, consisting of the same number of fixed length fields in a particular order.

a) pile

b) sequential

c) indexed sequential

d) indexed

Answer:b

15.When a thread waits indefinitely for some resource, but other threads are actually using it is called

a) Starvation

b) Demand Paging

c)Segmentation

d)None of them

Answer:a

PART-C

1. Contiguous allocation has two problems ___ and ___ that linked allocation solves.

a) external – fragmentation & size – declaration

b) internal – fragmentation & external – fragmentation

c) size – declaration & internal – fragmentation

d) memory – allocation & size – declaration

Answer: a

2.Which of the following is false about File system manipulation?

a) Computers can store files on the disk (Primary storage), for long-term storage purpose
b) Program needs to read a file or write a file.
c) Operating System provides an interface to the user to create/delete files.
d) Operating System provides an interface to create the backup of file system.

Answer: a

3. The OS ensures that all access to system resources is controlled. The major activities of an operating system with respect to?

a) Error handling
b) Resource Management
c) Protection
d) Communication

Answer: c

4. Which of the following program threat, "Such program traps user login credentials and stores them to send to malicious user who can later on login to computer and can access system resources."

a) Trojan Horse
b) Trap Door
c) Logic bomb
d) Virus

Answer: a

5. To delete an user along with its home directory, the command is

a) A userdel -d username
b) B userdel -D username
c) C userdel -r username
d) D userdel -R username

Answer: c

6. Context switching between two threads of execution within the operating system is usually performed by a small assembly language function. In general terms, what does this small function do internally?

i)Saves the current registers on the stack, then stores the stack pointer in the current thread's control block.
ii)Load the stack pointer for the new thread's control block and restore the registers it had saved, from its stack.
iii) The inode is a data structure which lists all attributes and points to all the addresses of the disk blocks
iv) Progress – The critical sections solution must not impede an entire thread's progress, halting the CPU.
a)i,ii b) ii,iii c)i,iii d)iii,iv
Answer:a

7. What is the maximum file size supported by a file system with 16 direct blocks, single, double, and triple indirection? The block size is 512 bytes. Disk block numbers can be stored in 4 bytes.

a)2.0MB b)0.89GB c)1.08GB d)5GB

Answer:c

Number of blocks:
- Direct Blocks = 16 blocks
- Single Indirect Blocks = 512 / 4 = 128 blocks
- Double Indirect Blocks = 128 * 128 = 16384 blocks
- Triple Indirect Blocks = 128 * 128 * 128 = 2097152 blocks

Total number of blocks = direct + single + double + triple = 16 + 128 + 16384 + 2097152 = 2113680
Total number of bytes = 2113680 * 512 = 1.08220416 E 9 = 1.08 GB

8. If the swap space is simply a large file, within the file system, _____ used to create it, name it and allocate its space.

a) special routines must be

b) normal file system routines can be

c) normal file system routines cannot be

d) swap space storage manager is

Answer:b

9. When a fixed amount of swap space is created during disk partitioning, more swap space can be added only by?

I) repartitioning of the disk

II) adding another swap space elsewhere

a) only I

b) only II

c) both I and II

d) neither I nor II

Answer:c

10. For swap space created in a separate disk partition where no file system or directory structure is placed, _____ used to allocate and deallocate the blocks.

a) special routines must be

b) normal file system routines can be

c) normal file system routines cannot be

d) swap space storage manager is

Answer:d

UNIT 4

VIRTUAL MEMORY

PART B

1)Let us assume that the user process is of size 2048KB and on a standard hard disk where swapping will take place has a data transfer rate around 1 MB per second. The actual transfer of the 1000K process to or from memory will take

a) **2000 milliseconds**
b) 1000 milliseconds
c) 100 milliseconds
d) 200 milliseconds

Solution: 2048KB / 1024KB per second

= 2 seconds

= 2000 milliseconds

2) Consider a mechanism that performs demand paging on an operating system. The average device memory access time is M units if the corresponding memory page is accessible in memory, and D units if a page fault is triggered by memory access. It has been measured experimentally that X units are the average time taken for a memory access in the process.

(A) $(D – M) / (X – M)$
(B) $\boldsymbol{(X – M) / (D – M)}$
(C) $(D – X) / (D – M)$
(D) (D) $(X – M) / (D – X)$

Solution: Given, average time for a memory access = M units if page hits, and average time for a memory access = D units if page fault occurred.

And total/experimental average time taken for a memory access = X units.

Let page fault rate is p. Therefore,

Average memory access time = (1 – page fault rate) * memory access time when no page fault + Page fault rate * Memory access time when page fault

3) Note that Belady's anomaly is that as the number of assigned frames increases, the page-fault rate can increase. Now, take a look at the following statements:

S1: Belady's phenomenon suffers from a random page replacement algorithm (where a page chosen at random is replaced)
S2: The replacement LUR page algorithm is suffering from Belady's anomaly. Which of the following is valid?

(A) S1 is true,S2 is true
(B) S1 is true,S2 is false
(C) S1 is false ,S2 is true
(D) S1 is false,S2 is false

Solution: Belady's anomaly proves that it is possible to have more page faults when increasing the number of page frames while using the First in First Out (FIFO) page replacement algorithm. For example, if we consider reference string 3 2 1 0 3 2 4 3 2 1 0 4 and 3 slots, we get 9 total page faults, but if we increase slots to 4, we get 10 page faults.

S1: Random page replacement algorithm (where a page chosen at random is replaced) suffers from Belady's anomaly.
-> Random page replacement algorithm can be any including FIFO so its true
S2: LRU page replacement algorithm suffers from Belady's anomaly .
-> LRU does'nt suffer from Belady's anomaly .
Therefore, **option B** is correct

4)Consider the following page reference string: 7, 2, 3, 1, 2, 5, 3, 4, 6, 7, 7, 1, 0, 5, 4, 6, 2, 3, 0, 1 Using the LRU, with 3 frames, show the page load order and number of page faults that would occur.

(A) 18 Page fault
(B) 12 Page fault

(C) 24 Page fault
(D) 32 Page fault

Solution: LRU (18 page faults): 7; 7 2; 7 2 3; 1 2 3; 1 2 5; 3 2 5; 3 4 5; 3 4 6; 7 4 6; 7 1 6; 7 1 0; 5 1 0; 5 4 0; 5 4 6; 2 4 6; 2 3 6; 2 3 0; 1 3 0

5)Let the reference for the page and the window for the working set be c c d b c e c e a d and 4, respectively. The original collection of jobs at the time t=0 Contains pages {a, d, e} where, at the time, a was referenced t=0,d At the time, was referenced t=−1, and e At the time, was referenced t=−2. Determine the average number of page frames.

(A) 8
(B) 6
(C) 5
(D) 12

Solution: Window size of working set =4

Initial pages in the working set window ={e,d,a}={e,d,a}

Incoming pageccdbceceadTime12345678910Working set window{e,d,a,c}{d,a,c}{a,c,d}{c,d,b}{d,b,c}{d,b,c,e}{b,c,e}{c,e}{c,e,a}{c,e,a,d}Hit/ MissmisshithitmisshitmisshithitmissmissCurrent window size4333343234Incoming pageTimeWorking set windowHit/ MissCurrent window sizec1{e,d,a,c}miss4c2{d,a,c}hit3d3{a,c,d}hit3b4{c,d,b}miss3c5{d,b,c}hit3e6{d,b,c,e}miss4c7{b,c,e}hit3e8{c,e}hit2a9{c,e,a}miss3d10{c,e,a,d}miss4

Total number of page faults =5

6)Find a device for computers with 40-bit virtual addressing method and 16 kilobytes of page size. If the computer system has a single-level page table per process and needs 48 bits for each page table entry, then the size of the page table per process is megabytes.

(A) 384
(B) 426
(C) 520
(D) 628

Solution: No of bits in offset = log 16KB = 14

No of pages = 2 ^ (40 - 14) = 2^26

Size of each PMT entry = 48 / 8 = 6 B

Size of PMT = 2^ 26 * 6 = 384 MB

7)Consider a paging scheme that uses a primary memory 1-level page table and a TLB for translating addresses. 100 ns is required for each main memory access and 20 ns for TLB lookup. Each move of a page to/from the disk requires 5000 ns. Assume the TLB hit ratio is 95 percent, 10 percent of the page fault rate. Assume that a dirty page must be written back to the disk before the deadline for 20 percent of the total page faults.

(A) 154.7

(B) 150.4

(C) 154.4

(D) 162

Solution: Given,

1. Main Memory access time: 100
2. TLB lookup time: 20 ns
3. Time to transfer one page to/from disk: 5000 ns
4. TLB hit ratio: 0.95
5. Page fault rate: 0.10
6. 20 % of page faults needs to be written back to disk

Hence, effective memory access time =

0.95(20+100)+0.05{0.90(20+100+100)+0.10[0.80(20+100+5000+100)+0.20(20+100+5000+5000+100)]}

= 155.0

8) A framework uses three page frames for the main memory storage of process files. It uses the substitution policy for the First in First out (FIFO) page. Assume all the frames of the page are initially empty. What is the total number of page faults that occur when the page reference string below is being processed? For eg, 4, 7, 6, 1, 7, 6, 1, 2, 7, 2. Calculate the hit ratio.

(A) 0.4

(B) 0.6

(C) 0.8

(D) 1

9) Find a series of references: 4, 7, 6, 1, 7, 6, 1, 2, 7, 2. The number of memory frames is 3. Find out the number of page errors corresponding to Optimal Page Replacement Algorithm

(A) Number of Page fault = 7

(B) Number of Page fault = 5

(C) Number of Page fault = 12

(D) Number of Page fault = 10

10) There are 3 page frames which are initially empty. If the page reference string is 1, 2, 3, 4, 2, 1, 5, 3, 2, 4, 6, the number of page faults using the optimal replacement policy is_____.
(A) 5
(B) 6
(C) 7
(D) 8

Solution: In optimal page replacement replacement policy, we replace the place which is not used for longest duration in future.

Given three page frames.

Reference string is **1, 2, 3, 4, 2, 1, 5, 3, 2, 4, 6**

Initially, there are three page faults and entries are
1 2 3

Page 4 causes a page fault and replaces 3 (3 is the longest distant in future), entries become
1 2 4
Total page faults = 3+1 = 4

Pages 2 and 1 don't cause any fault.

5 causes a page fault and replaces 1, entries become
5 2 4
Total page faults = 4 + 1 = 5

3 causes a page fault and replaces 5, entries become
3 2 4
Total page faults = 5 + 1 = 6

3, 2 and 4 don't cause any page fault.

6 causes a page fault.
Total page faults = 6 + 1 = 7

11) Given that he Memory access time = 200 nanoseconds. Average page-fault service time = 8 milliseconds EAT = (1 – p) x 200 + p (8 milliseconds) = (1 – p x 200 + p x 8,000,000 = 200 + p x 7,999,800 If one access out of 1,000 causes a page fault, find EAT.

(A) 8.2 microseconds

(B) 7.4 microseconds

(C) 6.4 microseconds

(D)7.2 microseconds

12) For instance, in a system with 62 frames, if there is a process of 10KB and another process of 127KB, how many frames are required by the first process and the other process

(A) 6 frames,54 frames

(B) 4 frames,57 frames

(C) 8 frames 62 frames

(D) 12 frames 74 frames

Solution: the first process will be allocated (10/137)*62 = 4 frames and the other process will get (127/137)*62 = 57 frames.

13) In a paged memory, the page hit ratio is 0.35. The time required to access a page in secondary memory is equal to 100 ns. The time required to access a page in primary memory is 10 ns. The average time required to access a page is

(A) 3.0 ns

(B) 68.5 ns

(C) 68.0 ns

(D) 78.5 ns

Solution: Hit ratio = 0.35
Time (secondary memory) = 100 ns
T(main memory) = 10 ns
Average access time = $h(T_m) + (1 - h) (T_s)$
= 0.35 x 10 +(0.65) x 100
= 3.5 + 65
= 68.5 ns

14) Consider a computer with 8 Mbytes of main memory and a 128 K cache. The cache block size is 4 K. It uses a direct mapping scheme for cache management. How many different main memory blocks can map onto a given physical cache block ?

(A) 2048

(B) 64

(C) 256

(D) 1022

Solution: The computer with 8 Mbytes of main memory and a 128 K cache. The cache block size is 4K. It uses a direct mapping scheme for cache management. 64 different main memory blocks can map into a given physical cache block.

The cache provides in-memory storage and management for your data.
A cache is a hardware or software component that stores data so that future requests for that data can be served faster; the data stored in a cache might be the result of an earlier computation or a copy of data stored.
The simplest way of associating main memory blocks with cache block is the direct mapping technique.

15) Consider following page trace :4,3,2, 1,4,3,5,4,3,2, 1,5
Number of page faults that would occur if FIFO page replacement algorithm is used with Number of frames for the Job M=3, will be

(A) 9

(B) 8

(C) 10

(D) 12

Solution:

When M-3

T	1	2	3	4	5	6	7	8	9	10	11	12
Page Sequence	4	3	2	1	4	3	5	4	3	2	1	5
Memory Frame 1st	4	4	4	1	1	1	5	5	5	5	5	5
2nd		3	3	3	4	4	4	4	4	4	1	1
3rd			2	2	2	3	3	3	3	2	2	2
Page fault	y	y	y	y	y	y	y	n	n	y	y	n

Total Page Fault = 9

PART C

1) An operating system supports a paged virtual memory. The central processor has a cycle time of 1 microsecond. It costs an additional 1 microsecond to access a page other than the current one. Pages have 1,000 words, and the paging device is a drum that rotates at 3,000 revolutions per minute and transfers 1 million words per second. The following statistical measurements were obtained from the system: • One percent of all instructions executed accessed a page other than the current page. • Of the instructions that accessed another page, 80 percent accessed a page already in memory. • When a new page was required, the replaced page was modified 50 percent of the time. Calculate the effective instruction time on this system, assuming that the system is running one process only and that the processor is idle during drum transfers

(A) 42 microseconds

(B) 34 microseconds

(C) 68 microseconds

(D) 30 microseconds

Solution: Effective access time =0.99*(1sec +0.008*2) +0.002*(10000 sec +1000 sec) + 0.001 * (10000 sec +1000 sec)

=(0.99 +0.016+22.0+11.0)= 34 sec

2) Consider the two-dimensional array A: int A[][] = new int[100][100]; where A[0][0] is at location 200 in a paged memory system with pages of size 200. A small process that manipulates the matrix resides in page 0 (locations 0 to 199). Thus, every instruction fetch will be from page 0. For three page frames, how many page faults are generated by the following array-initialization loops, using LRU replacement and assuming that page frame 1 contains the process and the other two are initially empty? **(a)** for (int j = 0; j < 100; j++) for (int i = 0; i < 100; i++) A[i][j] = 0; **(b)** for (int i = 0; i < 100; i++) for (int j = 0; j < 100; j++) A[i][j] = 0; Fill out the following table and provide a detailed elaboration. Without a detailed elaboration, you risk to receive a very low or even 0 points. Problem (a) (b)

(A) (a) A=5000,B=50;(b) A=10,000,B=200

(B) (a) A=500,B=100;(b) A=5000,B=500

(C) (a) A=1000,B=100;(b) A=200,B=500

(D)) (a) A=5000,B=100;(b) A=2000,B=500

Solution: Answer: The system has three page frames for this process. The first is for code and the second and third are for the array. Note that these three page frames do not have to be consecutive, even though the diagram below shows they are. The problem statement does not state the page size unit (i.e., byte or something else) and the size of an int. For simplicity, we just assume each unit of the size 200 page fits an int. In this case, each page can fit two rows or two

columns, depending on how the compiler stores a 2-dimensional array. If the compiler produces all entries of a row consecutively (i.e., row-major), then each page contains two rows. Otherwise, the compiler stores all entries of a column consecutively (i.e., column-major), then each page contains two columns. Because the code is in C style, the array is stored row-by-row (i.e., row-major). Because each entry in the array is only visited once, FIFO and LRU have no difference. In Part (a), the initialization goes column-by-column. Therefore, when a page is loaded into memory, it is only access twice, once per row. Refer to the diagram above for the details. Because the two available page frames are initially empty, once the initialization procedure starts, the first page is loaded in and accessed twice for row 0 and row 1. When the initialization goes to row 2, a page fault occurs and the second page is loaded, which is accessed twice for row 2 and row 3. In this way, just for column 0 for every two rows there is a page fault. To complete initialization for column 0, there will be 50 page faults. Because we have 100 columns, the number of page faults is 5,000= 50×100. Problem (a) (b) Answer 5,000 50 For Part (b), the initialization is done row-by-row. Consequently, we have one page faults for every two rows. Because we have 100 rows, the total number of page faults is 50 = 100/2. CS4411 Operating Systems Final Solutions – Spring 2019 8 If you interpret the size of 200 as 200 bytes and each int requires 4 bytes, then each row has 400 bytes (i.e., 2 pages) and there are 200 = 2×100 pages for matrix A[ ][ ]. For Part (b), A[ ][ ] is initialized row-by-row and, as a result, initializing each row generates 2 page faults and the total number of page faults is 200 = 2×100. For Part (a), A[ ][ ] is initialized column-by-column, and, each access to a row will cause a page fault because two page frames can only hold one row. Consequently, for each column there will be 100 page faults. Because there are 100 columns, the total number of page faults is 10,000= 100×100. Problem (a) (b) Answer 10,000 200

3) Consider a demand-paged computer system where the degree of multiprogramming is currently fixed at four. The system was recently measured to determine utilization of the CPU and the paging disk. Three alternative results are shown below. For each case, what is happening? Can the degree of multiprogramming be increased to increase the CPU utilization? Is the paging helping? Match the following

(i). CPU utilization 13 percent; disk utilization 97 percent a.CPU utilization is high and increase the degree of multiprogramming

(ii). CPU utilization 87 percent; disk utilization 3 percent b.Thrashing is occurring

(iii). CPU utilization 13 percent; disk utilization 3 percent c. Increase the degree of multiprogramming

(A) (i)-b,(ii)-a,(iii)-c

(B) (i)-a,(ii)-b,(iii)-c

(C) (i)-c,(ii)-a,(iii)-b

(D) (i)-a,(ii)-c,(iii)-b

4) A certain computer provides its users with a virtual memory space of 232 bytes. The computer has 222 bytes of physical memory. The virtual memory is implemented by paging, and the page size is 4,096 bytes. A user process generates the virtual address 11123456. Find the corresponding physical location.

(A) 11123456

(B) 12313511

(C) 10099988

(D) 12235578

Solution:

Given Data

Virtual memory: 2^{32} bytes
Physical memory: 2^{22} bytes
Page size: 4096 bytes $= 2^{12}$ bytes

Given physical address: 11123456

5) Consider a paging system with the page table stored in memory.

(i) If a memory reference takes 200 nanoseconds, how long does a paged memory reference take?

(ii)If we add associative registers, and 75 percent of all page-table references are found in the associative registers, what is the effective memory reference time? (Assume that finding a page-table entry in the associative registers takes zero time, if the entry is there)

(A) 400 nanoseconds; 200 nanoseconds to access the page table and 200 nanoseconds to access the word in memory, Effective access time=250 nanoseconds

(B) 200 nanoseconds; 400 nanoseconds to access the page table and 200 nanoseconds to access the word in memory, Effective access time=200 nanoseconds

(C) 100 nanoseconds; 200 nanoseconds to access the page table and 200 nanoseconds to access the word in memory, Effective access time=400 nanoseconds

(D) 600 nanoseconds; 250 nanoseconds to access the page table and 100 nanoseconds to access the word in memory, Effective access time=450 nanoseconds

6) Suppose we have a demand-paged memory. The page table is held in registers. It takes 8 milliseconds to service a page fault if an empty page is available or the replaced page is not modified, and 20 milliseconds if the replaces page is modified. Memory access time is 100 nanoseconds. Assume that the page to be replaced is modified 70 percent of the time. What is the maximum acceptable page-fault rate for an effective access time of no more than 200 nanoseconds?

(A) 0.000006
(B) 0.000012
(C) 0.000015
(D) 0.000024

7) A page-replacement algorithm should minimize the number of page faults. We can do this minimization by distributing heavily used pages evenly over all of memory, rather than having them compete for a small number of page frames. We can associate with each page frame a counter of the number of pages that are associated with that frame. Then, to replace a page, we search for the page frame with the smallest counter.How many page faults occur for your

algorithm for the following reference string, for four page frames? 1,2,3,4,5,3,4,1,6,7,8,7,8,9,7,8,9,5,4,5,4,2

(A) 10 page fault

(B) 14 page fault

(C) 7 page fault

(D) 28 page fault

8) Consider a demand-paging system with a paging disk that has an average access and transfer time of 20 milliseconds. Addresses are translated through a page table in main memory, with an access time of 1 microsecond per memory access. Thus, each memory reference through the page table takes two accesses. To improve this time, we have added an associative memory that reduces access time to one memory reference, if the page-table entry is in the associative memory.

Assume that 80 percent of the accesses are in the associative memory, and that, of the remaining, 10 percent (or 2 percent of the total) cause page faults. What is the effective memory access time?

(A) 0.4 ms

(B)0.8 ms

(C) 1.2 ms

(D)2.4 ms

Solution: Access Time = (0.8) * (1 microsecond) + (0.18) * (2 microsecond) + (0.02) * (20002 microsecond)

= 401.2 microsecond

= 0.4 millisecond

9) Consider the two-dimensional array A: **var** A: **array**[1..100] **of array**[1..100] of *integer*; where A[1][1] is at location 200, in a paged memory system with pages of size 200. A small process is in page 0 (location 0 to 199) for manipulating the matrix; thus, every instruction fetch will be from page 0.

For three page frames, how many page faults are generated by the following array-initialization

loops, using LRU replacement, and assuming page frame 1 has the process in it, and the other two are initially empty.

```
a.      for j:=1 to 100 do
            for i:= 1 to 100 do
                A[i][j]:=0;
b.      for i:=1 to 100 do
            for j:=1 to 100 do
          A[i][j]:=0;
```

(A) 5000 page fault, 50 page fault
(B) 2500 page fault, 100 page fault
(C) 6000 page fault, 200 page fault
(D) 2400 page fault, 120 page fault

Solution: The array is stored row-major; that is, the first data page contains A[1,1].A[1,2]....A[2,100] and the second page contains A[3,1],A[3,2]....A[4,100] and so on.

a. The page reference string is 0,1,0,2,0,....0,49,0,1,0,2,0.....0,49,...
   and thus there will be 5000 page faults.
b. The page reference string is 0,1,0,1,0,....0,49
   and thus there will be 50 page faults.

10) Consider the following segment table:

Segment	Base	Length
0	219	600
1	2300	14
2	90	100

3	1327	580
4	1952	96

What are the physical addresses for the following logical addresses?

a. 0,430 (i) 2310
b. 1,10 (ii) 649
c. 2,500 (iii)1727
d. 3,400 (iv) illegal reference, trap to operating system

(A) a- (ii),b-(i),c-(iv),d-(iii)
(B) a- (i),b-(ii),c-(iv),d-(iii)
(C) a- (ii),b-(iv),c-(i),d-(iii)
(D) a- (iIi),b-(i),c-(iv),d-(ii)

Solution:

a. (ii) 219+430 = 649
b. (i)2300 + 10 = 2310
c. (iv) illegal reference, trap to operating system
d. (iii) 1327+ 400= 1727

OPERATING SYSTEMS
TW0 MARK QUESTIONS AND ANSWERS

PART-B

1. Define operating system

An operating system is a set of program that controls, co-ordinates and supervises the activities of the computer hardware and software.

2. What is the role of an os?

An OS acts as an interface between the user and the computer. It acts as
The manager of the resources of the computer.

3. Write the functions of an OS .
   (i) Memory Management.
   (ii) Processor management.
   (iii) Interrupt Handling.
   (iv) Accounting.
   (v) Automatic job sequencing.
   (vi) Management and control of I/O devices

4. What is the need for an OS?

   A medium is needed to communicate between the user and the m/c. An OS acts as a medium of interface

5. What are the characteristics of an OS.
   (i) User friendly .
   (ii) Keep track of the status of each
   (iii) Allows sharing of resources(H/W and S/W).
   (iv) Provides adequate security.
   (v) Protection.

6. What is an interrupt ?

An event external to the currently executing process that causes a change int he normal flow of instruction execution; usually generated by hardware devices external to the CPU.

7.Define cache memory.

Cache memory is random access memory (RAM) that a computer microprocessor can access more quickly than it can access regular RAM. As the microprocessor processes data, it looks first in the cache memory and if it finds the data there (from a previous reading of data), it does not have to do the more time-consuming reading of data from larger memory.

8.What is the nucleus or kernel of an operating system?

Kernel is the part of the OS which directly makes interface with the Hardware system.

9.What are the main functions of the kernel?

To provide mechanism for

(i) creation and deletion of processes
(ii) inter process communication
(iii) synchronization of processes.

10.What are the components of an OS?

OS which is a collection of programs are of 2 types

(i) control program
(ii) supervisory program

11.What is multi programming?

The ability of keeping several jobs in the memory at one time, where The cpu is switched back and forth among them is called as Multi programming

12.What is the use of Multi Programming ?

Multi programming helps to increase CPU utilization, and to decrease the total time needed to execute the jobs.

13.Illustrate the factors that usually determine the degree of Multi Programming

(i) The number of Programs residing in Primary memory.
(ii) Passing of the control of the CPU rapidly between these programs.
(iii) Protection of user process from one another.

14.What are the Benefits of Multi Programming?

(i) Improves the System Performance.
(ii) Allows Time Sharing.
(iii) Supports multiple simultaneous interactive users

15. Explain what is Multi Processing?

The Simultaneous Processing of a number of Processes by a number of Processors Simultaneously at the same time is Multi Processing.

16. What is the advantage of Multi Processing Systems?

A Multi Processing System is one in which there are more than one CPU, interleaved with each other. So it helps in improving the amount of work done.

17. What are the types of Multi Processing?

(i) Symmetric Multi Processing
(ii) Asymmetric Multi Processing.

18. What is Symmetric Multi Processing?

It is one in which each processor runs an identical copy of the OS and these copies communicate with one another as needed.

19. What is Asymmetric Multi Processing?

It is one in which each processor is assigned a specific task. A Master Processor controls the system and the other Processors are allocated work by the Master Processor.

20.what is Time Sharing?

Time Sharing (or Multi tasking) is a logical extension of Multi Programming. It is a form of Multi Programmed OS which operates in an interactive mode with Quick response time.

21.Explain the concept of Time Sharing?

Multiple Jobs are executed by the CPU switching between them, but the switches occur so frequently that the users may interact with each program while it is running.

22. What is the benefit of Time Sharing?

A Time Sharing system allows many users to simultaneously share the computer resources.

23.Define Real Time Systems .

It is another form of OS which are used in environments where a large number of events mostly external to the computer system must be accepted and processed in a short time or within certain deadlines.

24. Give examples of Real Time Application

Ex's are

(i) Flight Control
(ii) Real Time Simulation
(iii) Military Application
(iv) Petroleum Refinery
(v) Process Control etc.

25. What is On-Line Processing?

Transferring the contents from the input directly on to the CPU and transferring the Processed contents onto the printer is On-Line Processing.

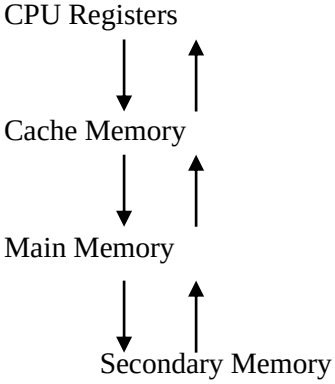
26. Explain Off-Line Processing ?

Rather than the CPU reading directly from the input, copying the content into CPU AND PROCESS.

27.What is Memory?

A Memory is the place for storage of data & information (or) it can be Defined as the work area of the computer where the microprocessor finds its data & instructions while the computer is working.

28.State the Memory Hierarchy :



29.What are the types of memory?

i) Internal Processor Memory

ii) Primary or Main Memory

iii) Secondary/Auxiliary/Backing Store are the types of memory.

30.What is primary memory?

This memory is directly accessible by the processor. It is mainly based on the Integrated circuits.

31.What is a process?

A process is basically a program in execution. It is the unit of work in a Modern operating system.

32.What is meant by a process state?

When a process executes, it changes, its status. This is known as process State.

33.What are the various process states ?

The various process states are

a. New
b. Ready
c. Running
d. Blocked
e. exit.

34.How does a process differ from a job?

A process is an active entity with a program counter specifying the next instructions to execute and a set to associated resources, whereas a batchSystem executes jobs.(which is a collection of processes).

35.Differentiate program and a process?

A process is a program in execution(ie) A program is a passive entity, Where as a process is an active entity.

36.What is process control Block?

Each process is represented in the operating system by a process control Block(PCB) also called a task control block.

37. What is the function of a process control block?.

A (PCB) contains many pieces of information associated with a specific Process. It serves as the repository for any information that may vary From process to process.

38.What are the information contained in a PCB?

A PCB contains pieces of information associated with a specific process, Namely

(i) Identifier

(ii) process state
(iii) program counter
(iv) Context data
(v) CPU scheduling information
(vi) Memory management information
(vii) Accounting information
(viii) I/O status information

39.What are the operations on process?

a.create a process
b.destroy a process
c.suspend a process
d.resume a process
e.change the priority of a process
f.block a process
g.wakeup a process
h.dispatch a process
i.enable a process to communicate with another

40. What are the operation involved in creating a process?

a. name the process
b. insert it in the system's known processes list(or) process table.
c. Determine the process's initial priority
d. Create the process control block
e. Allocate the process's initial resource.

41.What is the function of the ready queue?

The ready queue stores threads that aren't currently running, that are capable of resuming execution. There may be several ready queues for each priority level, depending on the scheduling algorithm. The scheduler consults the ready queue to determine which process/thread to run next. As the name suggests, the ready queue is a *queue*, in order to schedule fairly.

42. What is the relationship between threads and processes?

A processes is a container for threads, which has it's own memory space. A process may contain one or more threads, which share that memory space, all of the file descriptors and other attributes. The threads are the units of execution within the process, they posess a register set, stack, program counter, and scheduling attributes - *per thread.*

43. . Give the difference between multiprogramming and multiprocessing

A multiprocessing system is a computer hardware configuration that includes more than one independent processing unit. The term multiprocessing is generally used to refer to large computer hardware complexes found in major scientific or commercial applications.

44. Differentiate between pre-emptive and non-pre-emptive scheduling.

In a pre-emptive scheduling approach, CPU can be taken away from a process if there is a need while in a non-pre-emptive approach if once a process has been given the CPU, the CPU cannot be taken away from that process, unless the process completes or leaves the CPU for performing an Input Output. Pre-emptive scheduling is more useful in high priority process which requires immediate response, for example in real time system. While in nonpreemptive systems, jobs are made to wait by longer jobs, but treatment of
all processes is fairer.

45. . What is a semaphore? Explain busy waiting semaphores.

A semaphore is a protected variable or abstract data type which constitutes the classic method for restricting access to shared resources such as shared memory in a parallel programming environment.

Weak, Busy-wait Semaphores:

•The simplest way to implement semaphores.

•Useful when critical sections last for a short time, or we have lots of CPUs.

•S initialized to positive value (to allow someone in at the beginning).

•S is an integer variable that, apart from initialization, can only be accessed through atomic and mutually exclusive operations:

```
wait(s):
while (s.value != 0);
s.value--;
signal(s):
s.value++;
```

All happens atomically i.e. wrap pre and post protocols.

46. What are the four necessary conditions of deadlock prevention?

Four necessary conditions for deadlock prevention:

1. Removing the mutual exclusion condition means that no process may have exclusive access to a resource. This proves impossible for resources that cannot be spooled, and
even with spooled resources deadlock could still occur. Algorithms that avoid mutual exclusion are called non-blocking synchronization algorithms.

2. The "hold and wait" conditions may be removed by requiring processes to request all the resources they will need before starting up. Another way is to require processes to release all their resources before requesting all the resources they will need.

3. A "no preemption" (lockout) condition may also be difficult or impossible to avoid as a process has to be able to have a resource for a certain amount of time, or the processing outcome may be inconsistent or thrashing may occur. However, inability to enforce preemption may interfere with a

priority algorithm. Algorithms that allow preemption include lock-free and wait-free algorithms and optimistic concurrency control.

4. The circular wait condition: Algorithms that avoid circular waits include "disable interrupts during critical sections", and "use a hierarchy to determine a partial ordering of resources" and Dijkstra's solution.

47 Define deadlock? Explain the necessary conditions for deadlock to occur.

Deadlock is a situation, in which processes never finish executing and system resources are tied up, preventing other jobs from starting. A process requests resources; if the resources are not available at that time, the process enters a wait state. Waiting processes may never again change state, because the resources they have requested are held by other waiting processes, thereby causing deadlock.

Necessary conditions for deadlock to occur are:

i Mutual exclusion:

At least one resource must be held in a nonsharable mode; that is, only one process at a time can use the resource.

ii. Hold and wait:

A process must be holding at least one resource and waiting to acquire additional resources that are currently being held by other processes.

iii. No pre-emption:

Resources cannot be pre-empted; that is, a resource can be released only voluntarily by the process holding it, after the process holding it has its task.

iv. Circular wait:

A set{P0, P1,……, Pn) of waiting processes must exist such that P0 is waiting for a resource that is held by P1, P1 is waiting for a resource that is held by P2, ……., Pn-1 is waiting for a resource that is held by Pn and Pn is waiting for a resource that is held by P0. All four conditions must hold simultaneously for a deadlock to occur and conditions are not completely independent. For example, the circular-wait implies the hold-andwait condition.

48. What are the disadvantages of FCFS scheduling algorithm as compared to shortest job first (SJF) scheduling?

(i) Waiting time can be large if short requests wait behind the long ones.
(ii) It is not suitable for time sharing systems where it is important that each user should get the CPU for an equal amount of time interval.
(iii) A proper mix of jobs is needed to achieve good results from FCFS scheduling.

49.Categorize the CPU scheduling algorithms? Explain non-pre-emptive algorithms?

The various CPU scheduling algorithms are classified as follows:

Non preemptive algorithms: In this method a job is given to CPU for execution as long as the job is non completed the CPU cannot be given to other processes.

There are three types of non preemptive algorithms.

(i) First-come-first-serve (FCFS):

This is simplest CPU scheduling algorithm . With this scheme, the process that requests the CPU at first is given to the CPU at first. The implementation of FCFS is easily managed by with a FIFO queue.

(ii) Shortest-job-first (SJF):

This is also called SPN (shortest process next). In this the burst times of all the jobs which are waiting in the queue are compared. The job which is having the least CPU execution time will be given to the processor at first. In this turnaround time and waiting times are least. This also suffers with starvation. Indefinite waiting time is called as starvation. It is complex than FCFS.

(iii) Priority:

In this algorithm every job is associated with CPU execution time, arrival time and the priority. Here the job which is having the higher priority will be given to the execution at first. This also suffers with starvation. And by using aging technique starvation effect may be reduced.

50.Describe the necessary conditions for Deadlock.

1. Mutual exclusion
2. Hold and wait
3. No preemption
4. Circular wait

51.What is a Process Scheduling? Explain the different sub-functions of Process Scheduling.

Scheduling is a key part of the workload management software which usually perform some or all of:

- Queuing
- Scheduling
- Monitoring
- Resource management
- Accounting

52. Explain the Features of Major scheduling algorithms

1. FCFS – First come first served scheduling
2. Shortest job – First scheduling

3. Priority scheduling
4. Round robin scheduling

FCFS-
1. Process that request the CPU first is allocated CPU first
2. Managed by FIFO queue.
3. Average waiting time is generally long
4. Non preemptive
5. Troublesome for time sharing systems

Shortest job first
1. The process which has the smallest CPU burst time gets first
2. It increases the waiting time of long processes.
3. Problem – difficult to predict the length of next CPU request
4. May be preemptive or non preemptive

Priority
1. Highest priority process gets CPU allocation first
2. The larger the CPU burst, lower the priority
3. Priority can be defined internally or externally
4. Can be preemptive or non-preemptive
5. Problem-starvation, blocking of process
6. Solution – aging – increases the priority

Round robin Time quantum from 10 100 millisecond is defined
2. Processes are considered in circular queue
3. CPU allocation is divided among processes accordingly
4. Performance depends heavily on time quantum
5. Preemptive

53. What is Starvation?

starvation is a multitasking-related problem, where a process is perpetually denied necessary resources. Without those resources, the program can never finish its task.

54.How binary semaphore is different from general semaphore?

General semaphore also called counting semaphore. It is a varible n whose value equal to no. of items in the buffer where as binary is more restricted version having 0 and 1 value. Binary semaphore are easier to implement. If there are several processes are waiting for critical section. General semaphore value is extended to more negative but in case of binary semaphore, semaphore value only between 0 and 1.

55. State: Critical section.

Each processes has a segment of code, called critical section in which the process may be changing common variables, called a critical section. It is to design a protocol that the processes can use to cooperate.

56.Why is the capability to relocate processes desirable?

A process may occupy different partitions which means different absolute memory locations during execution (from swapping).Compaction will also cause a program to occupy a different partition which means different absolute memory locations

57.What is the difference between external and internal fragmentation?

External Fragmentation: External Fragmentation happens when a dynamic memory allocation algorithm allocates some memory and a small piece is left over that cannot be effectively used. If too much external fragmentation occurs, the amount of usable memory is drastically reduced. Total memory space exists to satisfy a request, but it is not contiguous.

Internal Fragmentation: Internal fragmentation is the space wasted inside of allocated memory blocks because of restriction on the allowed sizes of allocated blocks. Allocated memory may be slightly larger than requested memory; this size difference is memory internal to a partition, but not being used.

58.What are the distinctions among logical relative and physical addresses?

A logical address is 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.

A relative address is a particular example of logical address, in which the address is expressed as a location relative to some known point, usually a value in a processor register.

A physical address, or absolute address, is an actual location in main memory.

59.What is the difference between Page and Frame?

In a paging system, programs and data stored on disk are divided into equal, fixed sized blocks called pages, and main memory is divided into blocks of the same size called frames. Exactly one page can fit in one frame. Physical memory is divided into parts called FRAME and logical memory is divided into parts called PAGE.

60.Explain the difference between page and segment?

In segmentation, the address space is typically divided into a preset number of segments like data segment (read/write), code segment(read-only), stack(read/write) etc. And the programs are divided into these segments accordingly.While with paging, the address space is divided into a sequence of fixed size units called "pages".

61.What is the advantage and disadvantage of fix partition?

A fixed partition cannot be moved or expanded; therefore, one advantage would be that you know how much space can be used, and might keep better track of what you are using. The

disadvantage is that it cannot be expanded; once you run out of space it takes a bit of work to get a larger partition, and that may not be possible if the physical space is exceeded.

62. what you mean by thrashing?

In a steady state partially all of main memory will be occupied with process pieces, so that the processor and OS have direct access to as many process as possible .Thus, when the OS brings one piece in, it must throw out another .if it throw out a piece just before it is used, then it just have to go get that piece again almost immediately too much of this lead to a condition called THRASHING,

63. What is the Translation Lookaside Buffer - TLB?

In a cached system, the base addresses of the last few referenced pages is maintained in registers called the TLB that aids in faster lookup. TLB contains those page-table entries that have been most recently used.

64. What is optimal algorithm?

It selects the page for which time to the next reference in the longest.

65. What is page fault?

The processor also update the TLB to include the new page table entry. If the present bit is not set, then the desired page is not in main memory and a memory access fault, called a page fault.

66. What is replacement policy?

When a non-resident page is needed by a process, the OS must decide which resident page is to be placed by the requested page, the part of virtual memory which makes this decision is called the replacement policy.

67. What is first in first out policy?

The pages to be replaced is the “oldest” page in the memory, the one which was loaded before all the other.

68. What is least recently used(LRU)?

The page to be replaced is the one which has not been referenced ,siceaii the other has been referenced.

69. What is demand paging?

Demand paging only brings pages into main memory when a reference is made to a location on the page. Many page faults when process first started.

70. What is prepaging?

Prepaging brings in more pages than needed more efficient to bring in pages that reside contiguously on the disk.

71. What is clock policy?

-ADDITIONAL bit called user bit.

-when a page is first loaded In memory, the user bit is set to 0.

-when the page is refered ,the user bit is set to 1.

-during the search for replacement,each user bit set to 1 is changed to 0.

72.Define Frame Locking.

– If frame is locked, it may not be replaced

– Kernel of the operating system
– Control structures
– I/O buffers
– Associate a lock bit with each frame

73. Define seek time and latency time?

The time taken by the head to move to the appropriate cylinder or track is called seek time. Once the head is at right track, it must wait until the desired block rotates under the read- write head. This delay is latency time.

74. What are the allocation methods of a disk space?

Contiguous allocation
Linked allocation
Indexed allocation

75. What are the drawbacks of contiguous allocation of disk space?

· Suffers from external fragmentation
· Suffers from internal fragmentation
· Difficulty in finding space for a new file.
· Size of the file is to be declared in advance.

76. What are the disadvantages of linked allocation?

· Used only for sequential access of files.
· Space required for the pointers.
· Reliability.

77. What are the advantages of Indexed allocation?

· No external-fragmentation problem
· Solves the size-declaration problems.
· Supports direct access

78. What are the advantages of Contiguous allocation?

· Supports direct access and sequential access
· Number of disk seeks is minimal

79. What are the advantages of Linked allocation?

No external fragmentation
Size of the file does not need to be declared.

80. How Free-space management is implemented using bit vector?

Free-space list is implemented as a bit map or bit vector. Each block is represented by 1 bit. If the block is free, the bit is 1; if the block is allocated, the bit is 0.

81. Define rotational latency?
Rotational latency is the additional time waiting for the disk to rotate the desired to the disk to rotate the desired sector to the disk head.

82. What are the various Disk-Scheduling algorithms?
· First Come First Served Scheduling
· Shortest Seek Time First Scheduling
· SCAN Scheduling
· C-SCAN Scheduling
· LOOK Scheduling

83. What is a file?
A file is a named collection of related information that is recorded on the secondary storage. Commonly, files represent programs and data. In general, file is a sequence of bits, bytes, lines, or records.

84. List the various file attributes?
Name, Identifier, Type, Location, Size, Protection, Time, date and user identification.

85. What are the various file operations?
· Creating a file
· Writing a file
· Reading a file
· Repositioning within a file
· Deleting a file
· Truncating a file.

86. What are the Access methods for files?
Sequential Access
Direct Access
Indexed Access.

87. What is the use of relative block number in direct access?
The relative block number allows the operating system to decide where the file should be placed , and helps to prevent the user from accessing portions of the file system that may not be part if his file.

88. What is Directory?

The device directory or simply known as directory records information- such as name, location, size, and type for all files on that particular partition. The directory can be viewed as a symbol table that translates file names into their directory entries.

89. What are the most common schemes for defining the logical structure of a directory?

Single-Level Directory
Two-level Directory
Tree-Structured Directories
Acyclic-Graph Directories
General Graph Directory.

90.What is a file management system?

It is a way to store and retrieve information from disk drives; controls how files can be created, accessed, retrieved, and deleted.

91.What criteria is important in choosing a file organization?

file volatility
file activity
file size
file queries
data currency.

OPERATING SYSTEMS

PART-C

1.Explain the following

i) The basic elements of a computer system

ii)Processor register

2.Discuss Instruction execution with example.

3.Explain in detail

i)how interrupts are processed.

ii)how multipleinterrupts are handled.

4.Explain in detail about memory hierarchy.

5.Explain the different I/O communication techniques.

6.Discuss the evolution of operating system.

7.Draw and explain Windows Architecture.

8.Explain the essential properties of the following operating systems.

a)Batch b)Interactive

c)Time sharing d)Real Time

e)Network f)parallel

g)Distributed h)clustered

9.Explain in detail the single thread and multithread process model with diagrams.

10.Compare user level and kernel level threads with necessary diagrams.

11.Explain how micro kernel architecture differs from layered kernel architecture.

12. i)Explain in detail the various reasons involved in process creation and termination.

ii)Compare mode switching and process switching.

13.With neat diagram explain the five states involved in process model.

14. 1.Explain the following

i) OS control structures

ii)Process control structures

15.Describe about Mutual exclusion.

16.Write about Semaphores and give tha algorithms where ever necessary.

17.Narrate about producer consumer problem with algorithm

18.Explain about Monitors

19. Narrate about Readers/Writers problem with algorithm

20.Explain in detail about Deadlock Avoidance with bankers algorithm.

21.Write about the scheduling algorithms.

22.Consider the following set of processes. With the length of CPU burst time given in ms.

Process	Process time	Priority
P1	8	3
P2	3	1(high)
P3	4	4
P4	2	2

i.Draw four Guntt charts illustrating the execution of these process using FCFS, SJF ,RR, Priority.(quantum=2)

ii.Find the turnaroundtime, waiting time, average time of each process of scheduling.

23. Explain briefly about the conditions for deadlock to occur.

24. Discuss Deadlock Prevention

25.Explain in detail about the memory partitioning.

26.Discuss virtual memory paging and segmentation with neat sketch.

27.Explain in detail about various page replacement algorithms.

28. Discuss combined paging and segmentation with neat sketch.

29.Write in detail about Linux memory management.

30. Explain the various file organization techniques.

31. Explain about various IO organization model.

32.Write in detail about various file allocation techniques.

33.Enumerate disk scheduling.

34.Explain file directories.