

**Department of Computer Science.  
Islamiah College (Autonomous).**

## **Question Bank Operating Systems**

**for  
III B.Sc.,/B.C.A./ B.Sc., (SW)  
Third Year – Sixth Semester**

**(315 Questions)**

<b>Unit</b>	<b>Part-A</b>	<b>Part-B</b>	<b>Part-C</b>	
<b>I</b>	14	13	11	
<b>II</b>	21	24	12	
<b>III</b>	26	27	20	
<b>IV</b>	32	28	17	
<b>V</b>	36	20	14	
<b>Total Questions</b>	<b>129</b>	<b>112</b>	<b>74</b>	<b>Grand Total 315</b>

**Unit I Part A (2Marks)**

1. What are the three main purposes of an operating system?
2. What are two security problems in multiprogramming and time-sharing environment?
3. What is the purpose of system calls?
4. What is TSR?
5. What is a kernel?
6. What is batch processing?
7. What is a distributed system?
8. What are real-time systems?
9. What is Client and Server machine?
10. What is a distributed lock manager?
11. List various attributes of file.
12. What is DMA?
13. List of any three examples of Operating System.
14. Differentiate multitasking and multiprogramming.

**Unit I Part B (5 Marks)**

1. List the four steps needed to run a program on a completely dedicated machine.
2. What is the main advantage of multiprogramming?
3. What are the main differences between operating systems for mainframe computers and PCs?
4. Explain how to ensure security problems in a time-shared machine
5. When is it appropriate for the operating system to waste resources?
6. What are three advantages and one disadvantage of multiprocessor systems?
7. What is the purpose of the command interpreter? Why is it usually separate from the kernel?
8. List five services provided by an operating system.
9. What is the purpose of system programs?
10. Explain fork() and exec() system calls.
11. Define Shell of an OS.
12. Define tightly coupled, loosely coupled systems.
13. What are the tradeoffs inherent in handheld computers?

### Unit I Part C (10 Marks)

1. Define the essential properties of the following types of operating systems.
  - a. Batch
  - b. Interactive
  - c. Time sharing
  - d. Real time
2. Define the essential properties of the following types of operating systems.
  - a. Network
  - b. Parallel
  - c. Distributed
  - d. Clustered
3. What is the main difficulty that a programmer must overcome in writing an operating system for a real-time environment?
4. Describe the differences between symmetric and asymmetric multiprocessing.
5. What are the five major activities of an operating system in regard to process management?
6. What are the three major activities of an operating system in regard to memory management?
7. What are the three major activities of an operating system in regard to secondary-storage management?
8. What are the five major activities of an operating system in regard to file management?
9. Explain both pros and cons - "Operating system should include applications and mail programs."
10. Explain in which cases it would be impossible for user-level programs to provide OS services.
11. Using system calls, write a program that reads data from one file and copies it to another file.

## Unit II Part A ( 2 Marks )

1. Define process.
2. What information is in the PCB?
3. What are threads?
4. What is context switch?
5. What are the different types of CPU registers in a typical operating system design?
6. Why does the computer must keep several processes in main memory?
7. Define Cooperating process and Independent process.
8. When process is marked as blocked for IO?
9. What is starvation?
10. When a process is in zombie state?
11. List process related commands in Unix OS.
12. Given n processes to be scheduled on one processor, how many different schedules are possible?
13. Define preemptive and non-preemptive scheduling.
14. List three examples of deadlocks that are not related to a computer-system environment.
15. Is it possible to have a deadlock involving only one process? Justify.
16. What are the deadlock conditions?
17. What are the methods for Handling Deadlocks states?
18. How to recover from deadlock state?
19. A process executes the code  
    fork ();  
    fork ();  
    fork ();  
    Find the total number of child processes created.
20. A process executes the code : for (i = 0; i < n; i++) fork();  
    How many total number of child processes are created?
21. What is an IPC?

## Unit II Part B ( 5 Marks )

1. Explain with diagram the process states?
2. Explain with diagram showing how CPU switch from process to process.
3. Write a script/program to create parent and child process.
4. Discuss exit(), wait(), abort(), execlp() system calls.
5. Write a program for IPC using message queues.
6. How Buffering can improve the performance of a computer system?
7. What is a process scheduler? State the characteristics of a good process scheduler?

8. What is scheduling? What criteria affects the scheduler's performance?
9. Discuss three major complications that concurrent processing adds to an operating system.
10. Describe the differences among short-term, medium-term, and long-term scheduling.
11. Describe the actions taken by a kernel to switch context between processes.
12. Suppose a process P wants to wait for two messages, one from mailbox A and one from mailbox B.  
What sequence of send and receive should it execute?
13. What sequence of send and receive should P execute if P wants to wait for one message from mailbox A or from mailbox B (or from both)?
14. A receive operation makes a process wait until the mailbox is nonempty. Devise a scheme that allows a process to wait until a mailbox is empty, or explain why such a scheme cannot exist.
15. What advantage is there in having different time-quantum sizes on different levels of a multilevel queueing system?
16. What are the CPU scheduling algorithm criteria?
17. How can we prevent the occurrence of a deadlock?
18. Explain the deadlock detection?
19. Suppose that a system is in an unsafe state. Show that it is possible for the processes to complete their execution without entering a deadlock state.
20. Consider a system consisting of four resources of the same type that are shared by three processes, each of which needs at most two resources. Show that the system is deadlock-free.
21. What are the benefits and the detriments of each of the following?
  - a. Direct and indirect communication    b. Symmetric and asymmetric communication
22. What are the benefits and the detriments of each of the following?
  - a. Automatic and explicit buffering    c. Send by copy and send by reference
  - b. Fixed-sized and variable-sized messages
23. Find the average waiting time, turnaround time using FCFS scheduling.

Process	Burst time
P0	7
P1	5
P2	2
P3	9

24. An operating system uses Shortest Remaining Time first (SRT) process scheduling algorithm.

Consider the arrival times and execution times for the following processes:

Process	Execution time	Arrival time
P1	20	0
P2	25	15
P3	10	30
P4	15	45

What is the total waiting time for process P2?

## Unit II Part C ( 10 Marks )

1. Consider the following:

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	3
p4	1	4
P5	5	2

Draw four Gantt charts for FCFS, SJF and RR (quantum = 1) scheduling.

Find turnaround time, waiting time for each. Which of the schedules results in minimal average waiting time?

2. Find the average waiting time ,turnaround time using (1) Preemptive short-job first (2) Non-preemptive short-job first?

Process	P1	P2	P3	P4	P5
Burst time	5	13	8	4	10
Arrival time	2	3	0	5	1

3. Find the average waiting time and turnaround time for executing using priority scheduling algorithm?

Process	P1	P2	P3	P4	P5
Burst time	5	13	8	6	12
Priority	1	3	0	4	2

4. Find the average waiting time , average turnaround time using round-robin algorithm, where time quantum is 5?

Process	P1	P2	P3	P4	P5
Burst time	11	4	14	9	21
Arrival time	5	0	0	1	2

5. Assume you have the following jobs to execute with one processor, with the jobs arriving in the order listed here. Use FCFS, SJF and Priority non-pre-emptive scheduling algorithm.
- Create a Gantt (timeline) chart illustrating the execution of these processes?
  - What is the average turnaround time, average waiting time for the processes?

Processes	Execution Time(milliseconds)	Priority
P1	80	2
P2	20	1
P3	10	3
P4	20	5
P5	50	4

6. Assume you have the following jobs to execute with one processor, with the jobs arriving in the order listed here. Use FCFS, SJF and Priority non-pre-emptive scheduling algorithm.

- Create a Gantt (timeline) chart illustrating the execution of these processes?
- What is the average turnaround time, average waiting time for the processes?

Processes	Execution Time(milliseconds)	Priority
P1	20	1
P2	10	2
P3	25	0
P4	15	4
P5	5	3

7. Use Round Robin pre-emptive scheduling algorithm. Time slice=10 milliseconds.

- Create a Gantt (timeline) chart illustrating the execution of these processes?
- What is the average turnaround time, average waiting time for the processes?

Processes	Execution Time(milliseconds)
P1	20
P2	10
P3	25
P4	15
P5	5

8. Consider a multilevel feedback queue scheduling with three queues q1, q2, and q3. q1 and q2 use round-robin algorithm with time quantum (TQ)= 5, and 4 respectively. q3 use first-come first-service algorithm. Find the average waiting time, average turnaround time for the following process?

Processes	P1	P2	P3	P4
Burst time	8	22	4	12

9. Consider the following snapshot of a system:

	<u>Allocation</u>	<u>Max</u>	<u>Available</u>
	ABCD	ABCD	ABCD
P <sub>0</sub>	0012	0012	1520
P <sub>1</sub>	1000	1750	
P <sub>2</sub>	1354	2356	
P <sub>3</sub>	0632	0652	
P <sub>4</sub>	0014	0656	

Answer the following questions using the banker's algorithm:

- What is the content of the matrix Need?
- Is the system in a safe state?
- If a request from process P1 arrives for (0,4,2,0), can the request be granted immediately?

10. Suppose we have two resources A and B. A has 6 and B has 3 instances. Can the system execute the following processes without deadlock occurring?

Process	Allocate		Maximum need	
	A	B	A	B
P1	1	1	2	2
P2	1	0	4	2
P3	1	0	3	2
P4	0	1	1	1
P5	2	1	6	3

11. Consider five processes P0, P1, . . . P5 and three resources A, B, and C. Is executing the following processes in safe state?

Process	Allocation			Maximum need			Available		
	A	B	C	A	B	C	A	B	C
P0	1	2	0	2	2	2	0	1	0
P1	1	0	0	1	1	0			
P2	1	1	1	1	4	3			
P3	0	1	1	1	1	1			
P4	0	0	1	1	2	2			
P5	1	0	0	1	5	1			

12. Suppose we have five processes and three resources, A, B and C. A has 2 B has 5 and C has 4 instances. Can the system execute the following processes without deadlock occurring, where we have the following?

Process	Maximum need			Allocation		
	A	B	C	A	B	C
P1	1	2	3	0	1	1
P2	2	2	0	0	1	0
P3	0	1	1	0	0	1
P4	3	5	3	1	2	1
P5	1	1	2	1	0	1



### Unit III Part A ( 2 Marks )

1. Why are, page sizes always powers of 2?
2. Consider a logical-address space of eight pages of 1,024 words each, mapped onto a physical memory of 32 frames. How many bits are in the logical address, and in physical address?
3. What are the advantages of using demand paging?
4. What are the differences between pager and swapper?
5. How can the system distinguish between the pages that are in main memory from the pages that are on the disk?
6. How can measure the performance of demand paging?
7. Assume an average page-fault service time is 25 milliseconds and a memory access time is 100 nanoseconds. Find the Effective Access Time?
8. Define the terms Locality of reference and Garbage Collection
9. What is Compaction? How it is done in memory?
10. What is Overlay?
11. State the drawback of best fit memory allocation policy.
12. What is page hit and page miss?
13. What is dynamic linking?
14. When does the page fault occur?
15. Justify: There are pros and cons of choosing a small as well as large page size.
16. If the hit ratio to a TLB is 80%, and it takes 15 nanoseconds to search the TLB, and 150 nanoseconds to access the main memory, then what must be the effective memory access time in nanoseconds?
17. If the no of pages in a 32 bit machine is 8kB then what is the size of the page table?
18. In a 64 bit machine, with 256 MB RAM, and a 4KB page size, how many entries will there be in the page table if it's inverted?
19. Suppose we are operating with execution-time binding and the physical address generated is 305. The relocation register is set to 99. What is the corresponding logical address?
20. Why are segmentation and paging sometimes combined into one scheme?
21. What is swapping?
22. If a relocation register has value 1400 and logical address is 346 then what is its physical address in memory?
23. How many bytes user process gets, if available memory is 2560KB and the OS occupy 400KB?
24. What is segmentation?
25. How many page fault occurs in 1, 4, 1, 6, 1, 6, 1 if the frame size is 3, using FIFO algorithm?
26. Why optimal algorithm is difficult to implement?

### Unit III Part B ( 5 Marks )

1. Explain the difference between internal and external fragmentation.
2. When a process is rolled out of memory, it loses its ability to use the CPU. Describe another situation where a process loses its ability to use the CPU, but where the process does not get rolled out.
3. On a system with paging, a process cannot access memory that it does not own; why? How could the operating system allow access to other memory? Why should it or should it not?
4. Consider a paging system with the page table stored in memory.  
If a memory reference takes 200 nanoseconds, how long does a paged memory reference take?  
If we add TLBs, and 75 percent of all page-table references are found in the TLBs, what is the effective memory reference time?
5. Describe a mechanism by which one segment could belong to the address space of two different processes.
6. Explain why it is easier to share a reentrant module using segmentation than it is to do so when pure paging is used.
7. When will the page faults occur? What is the procedure for handling the page fault?
8. Assume that you have a page-reference string for a process with  $m$  frames. The page-reference string has length  $p$ ;  $n$  distinct page numbers occur in it. Answer these questions for any page replacement algorithms:
  - a. What is a lower bound on the number of page faults?
  - b. What is an upper bound on the number of page faults?
9. A certain computer provides its users with a virtual-memory space of  $2^{32}$  bytes. The computer has  $2^{18}$  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. Explain how the system establishes the corresponding physical location. Distinguish between software and hardware operations.
10. Consider the following page reference using three frames that are initially empty. Find the page faults using LRU algorithm, where the page reference sequence: 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1?
11. State and explain Storage management strategies?
12. Suppose that we have free segments with sizes: 6, 17, 25, 14, and 19. Place a program with size 13kB in the free segment using first-fit, best-fit and worst fit?
13. Define the virtual memory? What are its advantages?
14. What are the steps to modify the page-fault service routine to include page replacement?
15. What are the operations of page replacement algorithm?
16. What are the principles of the following replacement algorithms? a) FIFO. b) LRU.
17. Consider the following page reference using three frames that are initially empty. Find the page faults using FIFO algorithm, where the page reference sequence: 7,0,1, 2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1?

18. Consider the following page reference using four frames that are initially empty. Find the page faults using LRU algorithm, where the page reference sequence: 5,2,5,1,4,5,2,0,4,2,3,1,2,1,0,0,2,4,5,1?
19. Consider we have the following reference string: 5, 0, 4, 4, 0, 3, 0, 4, 1, 0, 2, 0, 5, 3, 0, 1. Find the page fault of virtual memory using LRU algorithm, where we used 4 frames?
20. State the functionality of the following: PTBR, PTLR, STBR, STLR
21. Write a note on memory management technique of segmentation with necessary diagram.
22. Explain the memory management technique of paging with necessary diagram.
23. With an example, explain how to compact memory.
24. Consider the reference string: 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6. How many page fault occurs using LRU replacement if there are three free frames?
25. Write a short note on Belady's anomaly.
26. Explain the difference between logical and physical address.
27. With your reference string, explain optimal page replacement algorithm.

### Unit III Part C ( 10 Marks )

1. Describe the following allocation algorithms: a. First fit b. Best fit c. Worst fit
2. Given memory partitions of 100 KB, 500 KB, 200 KB, 300 KB, and 600 KB, how would each of the first-fit, best-fit, and worst-fit algorithms place processes of 212 KB, 417 KB, 112 KB, and 426 KB? Which algorithm makes the most efficient use of memory?

3. 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. 0430    b. 110    c. 2500    d. 3400    e. 4112
4. Which of the following programming techniques and structures are "good" for a demand-paged environment? Which are "bad"? Explain your answers.
    - a. Stack    b. Hashed symbol table    c. Sequential search    d. Binary search
    - e. Pure code    f. Vector operations    g. Indirection
  5. Consider the following page-reference string: 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6. How many page faults would occur for the following replacement algorithms, assuming one, two, three, four, five, six, or seven frames?
    - a. LRU replacement    b. FIFO replacement    c. Optimal replacement
  6. What are the differences between?
    - i. Page table and segment table
    - ii. First-fit placement and best-fit placement

- iii. Contiguous and non – contiguous storage allocation
  - iv. Multiple contiguous fixed partitions (MFT) and multiple contiguous variable partitions (MVT).
  - v. Segmentation and paging storage
7. What are the advantages of?
- a) Overlays allocation storage. b) Compaction. c) Page table. d) Segment table.
8. Consider a user program of logical address of size 6 pages and page size is 4 bytes. The physical address contains 300 frames. The user program consists of 22 instructions a, b, c, . . . u, v . Each instruction takes 1 byte. Assume at that time the free frames are 7, 26, 52, 20, 55, 6, 18, 21, 70, and 90. Find the following?
- a) Draw the logical and physical maps and page tables?
  - b) Allocate each page in the corresponding frame?
  - c) Find the physical addresses for the instructions m, d, v, r?
  - d) Calculate the fragmentation if exist?
9. Consider a program consists of five segments S<sub>0</sub>=600 KB, S<sub>1</sub>=14 KB, S<sub>2</sub>=100 KB, S<sub>3</sub>=580 KB, and S<sub>4</sub>=96 KB. Assume at that time, the available free space partitions of memory are 1200–1805, 50 – 160, 220-234, and 2500-3180. Find the following:
- i. Draw logical to physical maps and segment table?
  - ii. Allocate space for each segment in memory?
  - iii. Calculate the external fragmentation and the internal fragmentation?
  - iv. What are the addresses in physical memory for the following logical addresses?
    - a. 0.580,      b. 1.17      c. 2.66      d. 3.82      e. 4.20?
10. Describe FIFO, LRU page replacement algorithm with their advantages and disadvantages.
11. 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  
Find the number of page faults in the following replacements if frames =5?
- (i) LRU Page Replacement (ii) FIFO Page Replacement (iii) Optimal Page Replacement
12. Consider following page reference string: 1, 2, 3, 4, 1, 4, 5, 6, 2, 1, 3, 7, 4, 2, 1, 3, 5, 6, 2, 1  
Find the number of page faults in the following replacements if frames =4?
- (i) LRU page replacement                      (ii) FIFO page replacement
13. Consider the following page reference string: 1,2,3,4,1,6,5,6,2,1,3,7,4,2,1,3,5,7,2,1  
Find the number of page faults in the following replacements if frames =4?
- (i) LRU Page Replacement (ii) FIFO Page Replacement (iii) Optimal Page Replacement
14. 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  
Find the number of page faults in the following replacements if frames =3?
- (i) LRU Page Replacement (ii) FIFO Page Replacement (iii) hardware implementation.

15. What is paging? How the paging is allocated by OS and explain its merits and demerits.
16. Describe Single and Multiple partitioned allocation in memory management.
17. Consider the following reference string 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. Use Optimal algorithm with three, four and five frames available.
18. How many page fault occurs for the reference string using FIFO and LRU algorithm with four free frames. 1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2.
19. Discuss virtual memory management technique.
20. Discuss demand paged memory management.

#### Unit IV Part A ( 2 Marks )

1. Explain various file types.
2. Describe various file access permissions.
3. What is Direct Access Method?
4. List six file attributes that may be recorded in a file system directory.
5. What is a file system directory used for?
6. List four common operations on files?
7. List four common operations on file system directories.
8. What are the disadvantages of a single level directory structure?
9. List the four layers that a file system implementation may have.
10. What is the main disadvantage of linked disk block allocation?
11. In a file system that uses contiguous block allocation, with blocks 1KB each, what is the block number and byte offset for byte number 16325 in the file?
12. What is the maximum file size in a file system that uses a single level, two level indexed block allocation, with a block size of 1KB and a block address of 8 bytes?
13. Which disk block allocation scheme can be used for free disk space management?
14. Why must the bit map for file allocation be kept on mass storage, rather than in main memory?
15. A disk drive spins at 9600 RPM, stores 300 KB per track, and has an average seek time of 8 ms.  
What is the average transfer time to read a 1 MB file, assuming the file is stored on consecutive tracks?
16. Why is it important for an operating system to schedule disk requests?
17. What is Raid? What are its advantages?
18. Can a direct access file be read sequentially? Explain.
19. List two types of system directories.
20. What is an i-node? How it is allocated?
21. What is difference between Inode Table and File Allocation Table?
22. Where Inode of a file, Inode Table and FAT get stored in the disk?
23. What is SCSI?
24. What is a sector, a cylinder?
25. What is a file in user's perspective and OS's perspective?
26. What is the use of truncating file operation?
27. How direct access performed on a file?
28. What is ISAM?
29. What is a symbolic link?
30. What is the need of controlled access?
31. If a disk size 500MB, how many block can allocate for 512KB size?
32. What is a bit vector?

#### Unit IV Part B ( 5 Marks )

1. Explain operations that can be performed on file.
2. Write a short note on ISAM.
3. Write a short note on file access with its command and security concerns.
4. Do all operating systems support the notion of a "file type"? Give one disadvantage and one advantage of supporting file types.
5. What file system actions have to take place when a file is opened, closed?
6. Define Seek time, Latency time, Access time and Response time of disks.
7. What important feature does an acyclic graph directory structure have that is missing from a tree structured directory?
8. Explain the difference between hard and soft links in an acyclic graph directory.
9. Describe what actions have to be taken when a hard, soft link is deleted in a file system.
10. Describe how individual access lists would provide file protection. Why are individual access lists not used in real operating systems?
11. Describe the process by which the file system partitions are all made available in an OS.
12. List advantages and disadvantages of a contiguous disk block allocation scheme?
13. What is the potential major drawback of using index disk block allocation? How may this potential drawback be overcome?
14. What is the maximal file size that may be allocated using contiguous, linked, indexed, linked indexed, two level indexed disk block allocation? Give your answer in terms of disk size, disk block size, and disk address size (as needed).
15. Consider a file currently consisting of 100 blocks. Assume that the FCB is already in memory. Calculate how many disk I/O operations are required for contiguous, linked, and indexed allocation strategies.
  - a) The block is added (i) at the beginning (ii) in the middle (iii) at the end.
  - b) The block is removed (i) at the beginning (ii) in the middle (iii) at the end.
16. Consider a system where free space is kept in a free-space list.
  - a) Suppose that pointer to the free-space list is lost. Can the system reconstruct the free-space list?
  - b) Suggest a scheme to ensure that the pointer is never lost as a result of memory failure.
17. What problems could occur if a system allowed a file system to be mounted simultaneously at more than one location?
18. Suppose that a disk drive has 200 cylinders, numbered from 0 to 199. The disk head is initially at cylinder 90. The queue of pending requests, in FIFO order, is: 59, 41, 172, 74, 52, 85, 139, 12, 194, 87
19. Explain Boot-block and Bad-block.
20. Draw the MS-DOS disk layout and explain.
21. What are different types of partitions and mounting?

22. What are the differences between logical partitioning and physical partitioning of disk?
23. How do we overcome the disadvantages of the two-level directory?
24. List operations to be performed on directories
25. Discuss ways in which an operating system can construct logical volumes which are more reliable and higher performance than the underlying hardware.
26. What is FAT? How it is implemented by Operating system?
27. Describe how the File blocks are allocated contiguous by the OS.
28. Is disk scheduling, other than FCFS useful in single user system? Explain your answer.

#### **Unit IV Part C ( 10 Marks )**

1. Explain the structure used to manage all information of file in UNIX operating system.
2. Describe (i) Tree structured directory (ii) Acyclic graph directory
3. Explain the merits and demerits of Indexed allocation.
4. Describe various disk scheduling algorithms with suitable example.
5. Give the basic steps for implementing, create, read, write, seek, delete and truncate operation on a file.
6. Explain the disk scheduling policies of FCFS, SSF, Elevator and circular scan.
7. In a contiguous, linked, indexed, linked indexed, two level indexed disk block allocation scheme, how is a logical disk address translated into a physical address?
8. Suppose that a disk drive has 200 cylinders, numbered from 0 to 199. The disk head is initially at cylinder 53. The queue of pending requests, in FIFO order, is: 98, 183, 37, 122, 14, 124, 65, 67  
Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms?  
a) FCFS    b) SSTF    c) SCAN    d) LOOK    e) C-SCAN    f) C-LOOK
9. Suppose that a disk drive has 5,000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is: 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms?  
a) FCFS    b) SSTF    c) SCAN    d) LOOK    e) C-SCAN    f) C-LOOK
10. Suppose that a disk drive has 200 cylinders, numbered from 0 to 199. The disk head is initially at cylinder 90. The queue of pending requests, in FIFO order, is : 59, 41, 172, 74, 52, 85, 139, 12, 194, 87  
Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms?  
a) FCFS    b) SSTF    c) SCAN    d) LOOK    e) C-SCAN    f) C-LOOK
11. Consider a disk system with 100 cylinders. The requests to access the cylinders occur in following sequence:4, 34, 10, 7, 19, 73, 2, 15, 6, 20. Assuming that the head is currently at cylinder 50, what is the



time taken to satisfy all requests if it takes 1ms to move from one cylinder to adjacent one and shortest seek time first policy is used?

12. Consider a disk pack with 16 surfaces, 128 tracks per surface and 256 sectors per track. 512 bytes of data are stored in a bit serial manner in a sector. Find the capacity of the disk and the number of bits required to specify a particular sector in the disk.
13. Briefly describe each of the SSTF, SCAN and C-SCAN disk scheduling algorithms. Which problem with SSTF does SCAN seek to overcome? Which problem with SCAN does C-SCAN seek to overcome?
14. Consider a Winchester-style hard disk with 100 cylinders, 4 double-sided platters and 25 sectors per track. The following is the (time-ordered) sequence of requests for disk sectors: 3518, 1846, 8924, 6672, 1590, 4126, 107, 9750, 158, 6621, 446, 11. The disk arm is currently at cylinder 10, moving towards 100. For each of SSTF, SCAN and C-SCAN, give the order in which the above requests would be serviced.
15. Explain how a bit vector may be used to implement free disk space management. What hardware support is important to bit vector free disk space management? What disk block allocation scheme works well with bit vector free disk space management?
16. Explain how linked disk block allocation works.
17. Discuss briefly swap-space management with an example.

## Unit V Part A ( 2 Marks )

1. What are the three general goals of computer security?
2. Which of the three goals of computer security is the following an attack on:
  - a) Network snooping
  - b) A distributed denial of service attack
  - c) Modifying your marks in the student records database
3. Describe what a buffer overrun attack is.
4. What is a covert channel and a spyware?
5. What does each row and column represent in an access matrix?
6. What is the benefit of using role-based access control?
7. Provide two examples of capability-based systems.
8. What is the most common technique for security attacks?
9. What is the most common approach for authenticating a user?
10. What is the first step of implementing a security defense?
11. What is the term when a system diverts an intruder to a location where the system can monitor the intruder's activity?
12. Define confinement problem.
13. What is a daemon process?
14. Differentiate between an intruder and cracker.
15. Define (i) threat (ii) attack in terms of security.
16. What is masquerading?
17. What is session hijacking?
18. What is phishing?
19. What is Trojan horse?
20. Differentiate between a worm and a virus.
21. What is DDoS?
22. What is a VPN and a SSL?
23. What is Vulnerability?
24. What is the difference between logical security and physical security?
25. What is Social Engineering?
26. What are digital signatures?
27. What is a hash function?
28. What is port scanning?
29. What is trap door?
30. What are characteristics of Authorization?
31. What is breach of integrity?

32. What is theft of service?
33. What are zombie systems?
34. What is known as sandbox?
35. What are encryption standards?
36. Fill in the blanks. MD5 produces \_\_\_ bits hash and SHA-1 produces \_\_\_ bit of hash ?

**Unit V Part B ( 5 Marks )**

1. Give an example of why it is important to consider the skill and resources available to likely intruders when designing computer security mechanisms and policies to defend against those intruders?
2. What is the principle of least privilege? Why is the setuid root facility in UNIX generally a violation of the principle? Give an illustrative example of that violation.
3. What is the difference between mandatory access control and discretionary access control?
4. What are access control lists and capabilities, and how do they relate to the protection matrix model of representing authority in a system.
5. What are the main differences between capability lists and access lists?
6. What protection problems may arise if a shared stack is used for parameter passing?
7. What is the need-to-know principle? Why is it important for a protection system to adhere to this?
8. Why is it difficult to protect a system in which users are allowed to do their own I/O?
9. What are the advantages of encrypting data stored in the computer system?
10. What is the problem when using a global table to represent an access matrix?
11. What are the four levels where security measures must be taken?
12. How does the principle of least privilege aid in the creation of protection systems?
13. Explain Stack and Buffer Overflow attack.
14. Define public and private key. Give examples.
15. Explain Authorization and Authentication with a difference.
16. Explain how a firewall protects, systems and networks.
17. Make a list of six security concerns for a bank's computer system. For each item in list, state whether this concern relates to physical, human, or operating-system security.
18. Discuss two pros and two cons of using watchdogs for security.
19. Discuss with examples of at least three program threats.
20. Discuss with examples of at least two system and network threats.

## Unit V Part C ( 10 Marks )

1. Explain how it is easier to apply the principle of least privilege in a capability-based system compared to an access-control-list-based system.
2. Describe the model including the properties that must be guaranteed for secrecy to be preserved.
3. Discuss the strengths and weaknesses of implementing an access matrix using access lists that are associated with objects.
4. Discuss the strengths and weaknesses of implementing an access matrix using capabilities that are associated with domains.
5. How can systems that implement the principle of least privilege still have protection failures that lead to security violations?
6. Discuss (i) Goals of protection (ii) Principles of protection (iii) Domain of protection
7. Explain why a capability-based system such as Hydra provides greater flexibility than the ring-protection scheme in enforcing protection policies.
8. How are the access-matrix facility and the role-based access-control facility similar? How do they differ?
9. Explain Symmetric and Asymmetric encryption schemes, with suitable example.
10. What is a Buffer-overflow attack? Explain how it can be avoided by adopting a better programming methodology.
11. What commonly used computer programs are prone to man-in-the middle attacks? Discuss solutions for preventing this form of attack.
12. Discuss Auditing, Accounting, and Logging as potential tools in a security system.
13. Explain the role of OTPs and Biometrics in User authentication.
14. Explain with an example of an intrusion-detection system and an intrusion-prevention systems.