SRM VALLIAMMAI ENGINEERING COLLEGE

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF CYBER SECURITY

QUESTION BANK

IV SEMESTER

1923401 - LINUX OPERATING SYSTEMS

Regulation – 2019

CHOICE BASED CREDIT SYSTEM

Academic Year 2021 – 22 (Even Semester)

Prepared by

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DEPARTMENT OF CYBER SECURITY

QUESTION BANK

SUBJECT : Linux Operating Systems

SEM / YEAR: IVSem/IIYear

UNIT I -PROCESSES			
Introduction to operating systems - Evolution of Operating System - Operating System-structures – System calls – System programs –Processes: Process concept – Process scheduling – Operations on processes –Inter process communication – Communication in client-server systems.			
PART - A			
Q.No	**Questions**	**BT Level**	**Competence**
1.	Differentiate between tightly coupled systems and loosely coupled systems.	BTL-2	Understanding
2.	List out the various operating system components.	BTL-1	Remembering
3.	Define Operating System.	BTL-1	Remembering
4.	What is the responsibility of kernel?	BTL-1	Remembering
5.	Consider a memory system with a cache access time of 10ns and a memory access time of 110ns – assume the memory access time includes the time to check the cache. If the effective access time is 10% greater than the cache access time, what is the hit ratio H?	BTL-4	Analyzing
6.	List out some system calls required to control the communication system.	BTL-4	Analyzing
7.	Differentiate between symmetric and asymmetric multiprocessor.	BTL-1	Remembering
8.	Is OS a resource Manager? If so justify your answer.	BTL-3	Applying
9.	What is meant by system call?	BTL-1	Remembering
10.	What is SYSGEN and system boot?	BTL-2	Understanding
11.	What is the purpose of system programs?	BTL-1	Remembering
12.	Compare and contrast DMA and Cache memory.	BTL-5	Evaluating
13.	Write the differences of batch systems and time sharing systems.	BTL-2	Understanding
14.	Do timesharing differ from multiprogramming? If so, How?	BTL-3	Applying
15.	What are the objectives of operating systems?	BTL-2	Understanding
16.	Why API's need to be used rather than system calls?	BTL-5	Evaluating
17.	How would you build clustered systems?	BTL-6	Creating
18.	What is dual mode operation and what is the need of it?	BTL-4	Analyzing
19.	Illustrate the use of fork and exec system calls.	BTL-3	Applying
20.	What are the advantages of Peer –to- peer system over client -server systems?	BTL-6	Creating
PART - B			

1.	(i) Explain the various types of system calls with an example for each.(8) (ii) Discuss the functionality of system boot with respect to an Operating System. (5)	BTL-5	Evaluating
2.	Illustrate how the operating system has been evolved from serial processing to multiprogramming system. (13)	BTL-3	Applying
3.	(i) Explain the various structure of an operating system. (8) (ii) Describe system calls and system programs in detail with neat sketch. (5)	BTL-1	Remembering
4.	Describe the evolution of operating system. (13)	BTL-2	Understanding
5.	(i).Discuss the pros and cons of simple processor system and multi core system and clustered system.(8) (ii).Explain the steps involved to transfer the stored historical information in a magnetic tapes to the CPU for further processing through various storage devices.(5)	BTL-2	Understanding
6.	State the operating system structure. Describe the operating system operations in detail. Justify the reason why the lack of a hardware supported dual mode can cause serious shortcoming in an operating system?(13)	BTL-6	Creating
7.	Explain the different architecture of OS starting from simple structure, layered structure, micro kernels, modules and hybrid systems, with suitable examples OS structure, including Google's Android(13)	BTL-3	Applying
8.	(i) Discuss about the evolution of virtual machines. Also explain how virtualization could be implemented in Operating Systems. (7) (ii) Discuss the different multiprocessor organizations with block diagrams. (6)	BTL-2	Understanding
9.	(i) Explain the various memory hierarchies with neat block diagram. (7) (ii) Explain interrupts in detail. (6)	BTL-1	Remembering
10.	How computer system handles interrupts? Discuss how interrupts can be handled quickly. (13)	BTL-4	Analyzing
11.	(i) Distinguish between the client server and peer to peer models of distributed systems. (7) (ii) Describe three general methods for passing parameters to the OS with Example. (6)	BTL-1	Remembering
12.	Discuss the essential properties of the following types of systems. (i) Time sharing systems. (4) (ii) Multi-processor systems. (4) (iii) Distributed systems. (5)	BTL-1	Remembering
13.	Explain cache memory and its mapping. (13)	BTL-4	Analyzing
14.	(i) How could a system be designed to allow a choice of operating systems from which to boot? What would the bootstrap program need to do?(8) (ii) Discuss about Direct memory access.(5)	BTL-4	Analyzing
PART - C			
1.	(i) With neat sketch discuss computer system overview.(8) (ii) Enumerate the different operating system structure and explain with neat sketch. (7)	BTL-6	Creating
2.	(i) State the basic functions of OS and DMA.(5) (ii) Explain system calls system programs and OS generation.(10)	BTL-5	Evaluating

3.	(i) Describe a mechanism for enforcing memory protection in order to prevent a program from modifying the memory associated with other programs. (8) (ii) What are the advantages and disadvantages of using the same system call interface for manipulating both files and devices? (7)	BTL-5	Evaluating
4.	(i) Describe in detail about multicore organization. (8) (ii) Computer system architecture deals about how the component of a computer system may be organized? Discuss detail about different architecture of a computer system. (7)	BTL-4	Analyzing

UNIT II -PROCESS SCHEDULING AND SYNCHRONIZATION

CPU Scheduling: Scheduling criteria – Scheduling algorithms – Multiple-processor scheduling. Process Synchronization: The critical-section problem –Synchronization hardware – Semaphores – Classic problems of synchronization –critical regions – Monitors. Deadlock: System model – Deadlock characterization –Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance –Deadlock detection – Recovery from deadlock.

PART - A

Q.No	Questions	BT Level	Competence
1.	Name and draw five different process states with proper definition.	BTL-1	Remembering
2.	Define the term 'Dispatch Latency'.	BTL-1	Remembering
3.	Is the context switching an overhead? Justify your answer.	BTL-4	Analyzing
4.	Distinguish between CPU bounded and I/O bounded processes.	BTL-2	Understanding
5.	Why is IPC needed? Name the two fundamental models of IPC.	BTL-1	Remembering
6.	Give a programming example in which multithreading does not provide better performance than single -threaded solutions.	BTL-4	Analyzing
7.	What are the benefits of synchronous and asynchronous communication?	BTL-3	Applying
8.	Differentiate single threaded and multi-threaded processes.	BTL-4	Analyzing
9.	Differentiate preemptive and non-preemptive scheduling.	BTL-2	Understanding
10.	List out the data fields associated with Process Control Blocks.	BTL-6	Creating
11.	"Priority inversion is a condition that occurs in real time systems where a low priority process is starved because higher priority processes have gained hold of the CPU" – Comment on this statement.	BTL-5	Evaluating
12.	What is meant by 'starvation' in operating system?	BTL-2	Understanding
13.	What is the concept behind strong semaphore and spinlock?	BTL-3	Applying
14.	Give the queueing diagram representation of process scheduling	BTL-2	Understanding
15.	What is the meaning of the term busy waiting?	BTL-5	Evaluating
16.	Elucidate mutex locks with its procedure.	BTL-1	Remembering
17.	Under what circumstances would a user be better off using a timesharing system rather than a PC or single –user workstation?	BTL-3	Applying
18.	What are the differences between user level threads and kernel level threads? Under what circumstances is one type better than the other?	BTL-5	Evaluating
19.	"If there is a cycle in the resource allocation graph, it may or may not be in deadlock state". Comment on this statement.	BTL-6	Creating
20.	List out the methods used to recover from the deadlock.	BTL-1	Remembering

<table>
<tr><th colspan="4">PART – B</th></tr>
<tr><td>1.</td><td>(i) Explain why interrupts are not appropriate for implementing synchronous primitives in multiprocessor systems. (8)
(ii) Compute the average waiting time for the processes using non-preemptive SJF scheduling algorithm.(5)
<table>
<tr><th>Process</th><th>Arrival time</th><th>Burst time</th></tr>
<tr><td>P1</td><td>0</td><td>7</td></tr>
<tr><td>P2</td><td>2</td><td>4</td></tr>
<tr><td>P3</td><td>4</td><td>1</td></tr>
<tr><td>P4</td><td>5</td><td>4</td></tr>
<tr><td>P5</td><td>3</td><td>4</td></tr>
</table></td><td>BTL-4</td><td>Analyzing</td></tr>
<tr><td>2.</td><td>Describe the differences among short- term, medium-term andlong-term scheduling with suitable example. (13)</td><td>BTL1</td><td>Remembering</td></tr>
<tr><td>3.</td><td>(i) What is a process? Discuss components of process and various states of a process with the help of a process state transition diagram. (8)
(ii) Write the difference between user thread and kernel thread.(5)</td><td>BTL2</td><td>Understanding</td></tr>
<tr><td>4.</td><td>Discuss how the following pairs of scheduling criteria conflict in certain settings.
i. CPU utilization and response time. (4)
ii. Average turnaround time and maximum waiting time. (5)
iii. I/O device utilization and CPU utilization. (4)</td><td>BTL1</td><td>Remembering</td></tr>
<tr><td>5.</td><td>(i) Discuss the actions taken by a kernel to context-switch between processes. (7)
(ii) Provide two programming examples in which multithreading does not provide better performance than a single threaded solution. (6)</td><td>BTL3</td><td>Applying</td></tr>
<tr><td>6.</td><td>Consider the following set of processes with the length of the CPU-burst time in given ms:
<table>
<tr><th>Process</th><th>Burst Time</th><th>Arrival time</th></tr>
<tr><td>P1</td><td>8</td><td>0</td></tr>
<tr><td>P2</td><td>4</td><td>1</td></tr>
<tr><td>P3</td><td>9</td><td>2</td></tr>
<tr><td>P4</td><td>5</td><td>3</td></tr>
<tr><td>P5</td><td>3</td><td>4</td></tr>
</table>
Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, priority and RR (quantum=2) scheduling. Also calculate waiting time and turnaround time for each scheduling algorithms.(13)</td><td>BTL3</td><td>Applying</td></tr>
<tr><td>7.</td><td>Explain the differences in the degree to which the following scheduling algorithms discriminate in favor of short processes:
(i) RR (7)
(ii) Multilevel feedback queues. (6)</td><td>BTL-4</td><td>Analyzing</td></tr>
<tr><td>8.</td><td>Outline a solution using semaphores to solve dinning philosopher problem. (13)</td><td>BTL-5</td><td>Evaluating</td></tr>
<tr><td>9.</td><td>(i) Show how wait () and signal () semaphore operations could be implemented in multiprocessor environments, using Test and Set instructions. The solution should exhibit minimal busy waiting. Develop pseudo code for implementing operations. (7)
(ii) Discuss about issues to be considered with multithreaded programs.(6)</td><td>BTL6</td><td>Creating</td></tr>
</table>

<table>
<tr><td>10.</td><td>Explain Deadlock detection with suitable example. (13)</td><td>BTL-4</td><td>Analyzing</td></tr>
<tr><td>11.</td><td>Consider the snapshot of a system(13)

<table>
<tr><td></td><td>Max
A B C D</td><td>Allocation
A B C D</td><td>Available
A B C D</td></tr>
<tr><td>P0</td><td>2 0 0 1</td><td>4 2 1 2</td><td>3 3 2 1</td></tr>
<tr><td>P1</td><td>3 1 2 1</td><td>5 2 5 2</td><td></td></tr>
<tr><td>P2</td><td>2 1 0 3</td><td>2 3 1 6</td><td></td></tr>
<tr><td>P3</td><td>1 3 1 2</td><td>1 4 2 4</td><td></td></tr>
<tr><td>P4</td><td>1 4 3 2</td><td>3 6 6 5</td><td></td></tr>
</table>
Answer the following Using Banker’s algorithm,
(i) illustrate that the system is in safe state by demonstrating an order in which the processes may complete?(5)
(ii)If a request from process P1 arrives for (1, 1, 0, 0) can the request begranted immediately? (4)
(iii)If the request from p4 arrives for (0, 0, 2, 0) can the request be grantedimmediately? (4)</td><td>BTL2</td><td>Understanding</td></tr>
<tr><td>12.</td><td>a) Explain thread and SMP management. (4)
b) Illustrate semaphores with neat example.(4)
c) The operating system contains 3 resources, the number ofinstance of each resource type are 7,7,10. The current resource allocation state is as shown below. Is the current allocation in a safe state? (5)
<table>
<tr><td rowspan="2">Process</td><td colspan="3">Current Allocation</td><td colspan="3">Maximum need</td></tr>
<tr><td>R1</td><td>R2</td><td>R3</td><td>R1</td><td>R2</td><td>R3</td></tr>
<tr><td>P1</td><td>2</td><td>2</td><td>3</td><td>3</td><td>6</td><td>8</td></tr>
<tr><td>P2</td><td>2</td><td>0</td><td>3</td><td>4</td><td>3</td><td>3</td></tr>
<tr><td>P3</td><td>1</td><td>2</td><td>4</td><td>3</td><td>4</td><td>4</td></tr>
</table></td><td>BTL1</td><td>Remembering</td></tr>
<tr><td>13.</td><td>(i) Explain the dining philosophers critical section problem solution using monitor.(8)
(ii) Write the algorithm using test-and –set () instruction that satisfy all the critical section requirements(5)</td><td>BTL2</td><td>Understanding</td></tr>
<tr><td>14.</td><td>(i) Is it possible to have concurrency but not parallelism?Explain.(6)
(ii) 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. (7)</td><td>BTL-3</td><td>Applying</td></tr>
<tr><td colspan="4">PART - C</td></tr>
<tr><td>1.</td><td>Which of the following scheduling algorithms could result in starvation?
(i)First-come, first-served (5)
(ii) Shortest job first (5)
(iii) Round robin (5)
Detail with Justification.</td><td>BTL-6</td><td>Creating</td></tr>
</table>

<table>
<tr><td>2.</td><td>(i).Consider the following set of processes with the length of CPU burst time given in milliseconds.
<table><tr><th>Process</th><th>Burst Time</th><th>priority</th><th>Arrival Time</th></tr><tr><td>P1</td><td>10</td><td>3</td><td>0</td></tr><tr><td>P2</td><td>1</td><td>1</td><td>1</td></tr><tr><td>P3</td><td>2</td><td>3</td><td>2</td></tr><tr><td>P4</td><td>1</td><td>4</td><td>1</td></tr><tr><td>P5</td><td>5</td><td>2</td><td>2</td></tr></table>Draw the Gantt chart for the execution of these processes using FCFS, SJF, SRTS, pre-emptive and non pre-emptive priority and Round robin with the time slice of 2ms, Find average waiting time and turnaround time using each of the methods.(10).
(ii).Explain –multi level queue and multi- level feedback queue scheduling with suitable examples(5)</td><td>BTL-5</td><td>Evaluating</td></tr>
<tr><td>3.</td><td>Consider a system consisting of ‘m’ resources of the same type, being shared by ‘n’ processes. Resources can be requested and released by processes only one at a time. Show that the system is deadlock free if the following two conditions hold: (15)
a) The maximum need of each process is between 1 and m resources
b) The sum of all maximum needs is less than m+n.</td><td>BTL-4</td><td>Analyzing</td></tr>
<tr><td>4.</td><td>Consider the following system snapshot using data structures in the Banker’s algorithm with resources A,B,C and D and process P0 to P4:
<table><tr><th></th><th>Max
A B C D</th><th>Allocation
A B C D</th><th>Available
A B C D</th><th>Need
A B C D</th></tr><tr><td>P0</td><td>6 0 1 2</td><td>4 0 0 1</td><td>3 2 1 1</td><td></td></tr><tr><td>P1</td><td>1 7 5 0</td><td>1 1 0 0</td><td></td><td></td></tr><tr><td>P2</td><td>2 3 5 6</td><td>1 2 5 4</td><td></td><td></td></tr><tr><td>P3</td><td>1 6 5 3</td><td>0 6 3 3</td><td></td><td></td></tr><tr><td>P4</td><td>1 6 5 6</td><td>0 2 1 2</td><td></td><td></td></tr></table>Using Banker’s algorithm, answer the following questions:
(i) How many resources of type A, B, C and D are there? (3)
(ii)What are the contents of the need matrix? (3)
(iii) Is the system in a safe state? Why? (3)
(iv) If a request from process P4 arrives for additional resources of (1, 2, 0, 0) can the banker’s algorithm grant the request immediately? Show the new system state and other criteria. (6)</td><td>BTL-5</td><td>Evaluating</td></tr>
</table>

<table>
<tr><th colspan="4">UNIT III - STORAGE MANAGEMENT</th></tr>
<tr><td colspan="4">Main Memory Management: Background – Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with paging. Virtual Memory: Background – Demand paging – – File–System Interface– File system mounting– Allocation methods</td></tr>
<tr><th colspan="4">PART - A</th></tr>
<tr><th>Q.No</th><th>Questions</th><th>BT Level</th><th>Competence</th></tr>
<tr><td>1.</td><td>Name any two differences between logical and physical addresses.</td><td>BTL-2</td><td>Understanding</td></tr>
<tr><td>2.</td><td>Differentiate paging and segmentation.</td><td>BTL-2</td><td>Understanding</td></tr>
<tr><td>3.</td><td>What is the purpose of paging the page tables?</td><td>BTL-4</td><td>Analyzing</td></tr>
<tr><td>4.</td><td>What is a working set model?</td><td>BTL-1</td><td>Remembering</td></tr>
</table>

5.	In memory management consider the program named as Stack1 which size is 100 KB. This program is loaded in the main memory from 2100 to 2200KB. Show the contents of the page map table for the given scenario.	BTL-6	Creating
6.	Define Swapping.	BTL-1	Remembering
7.	Is Windows Operating system implementing Virtual Memory? If so, How?	BTL-5	Evaluating
8.	What is principle of locality?	BTL-2	Understanding
9.	What are Overlays?	BTL-1	Remembering
10.	What is meant by address binding? Mention the different types.	BTL-1	Remembering
11.	Write about swapping. Let us assume the user process is of size 1MB and the backing store is a standard hard disk with a transfer rate of 5 MBPS. Calculate the transfer rate.	BTL-5	Evaluating
12.	Consider a logical address space of eight pages of 1024 words each, mapped onto a physical memory of 32 frames. How many bits are there in the logical address and in the physical address?	BTL-4	Analyzing
13.	Consider the following Segmentation 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 logical addresses 3400 and 0110?	BTL-5	Evaluating
14.	What do you mean by compaction? In which situation is it applied?	BTL-3	Applying
15.	Differentiate a page from segment.	BTL-1	Remembering
16.	What is meant by prepaging? Is it better than demand paging?	BTL-6	Creating
17.	Define external fragmentation.	BTL-1	Remembering
18.	Define demand paging in memory management. What are the steps required to handle a page fault in demand paging?	BTL-4	Analyzing
19.	Mention the significance of LDT and GDT in segmentation.	BTL-3	Applying
20.	Why are page sizes always powers of 2?	BTL-3	Applying
PART - B			
1.	What is demand paging? Describe the process of demand paging in OS. (13)	BTL-2	Understanding
2.	(i) With a neat sketch, explain how logical address is translated into physical address using Paging mechanism. (7) (ii) Write short notes on memory-mapped files (6)	BTL-1	Remembering
3.	Explain why sharing a reentrant module is easier when segmentation is used than when pure paging is used with example.(13)	BTL-3	Applying
4.	i. Discuss about free space management on I/O buffering and blocking. (7) ii. Discuss the concept of buddy system allocation with neat sketch. (6)	BTL-5	Evaluating
5.	Explain how paging supports virtual memory. With a neat diagram explain how logical address is translated into physical address.	BTL-2	Understanding

6.	Explain in detail about Contiguous Memory Allocation with a neat sketch.	BTL-6	Creating
7.	Given memory partitions of 500 KB, 100 KB, 300 KB, 200 KB and 600 KB in order, how would each of the first-fit, best-fit, and worst-fit algorithms place processes of size 418 KB, 202 KB, 506 KB,11 2 KB, and 95 KB (in order)? Which the algorithms make the most efficient use of memory? (7) (ii) Differentiate external fragmentation with internal fragmentation.(6)	BTL-4	Analyzing
8.	Compare paging with segmentation in terms of the amount of memory required by the address translation structures in order to convert virtual addresses to physical addresses. (13)	BTL-1	Remembering
9.	a) Explain the file allocation methods in detail. (7) b) Explain in detail about allocation of kernel memory. (6)	BTL-1	Remembering
10.	Draw the diagram of segmentation memory management scheme and Explain its principle. (13)	BTL-3	Applying
11.	a) Consider a logical address space of 8 pages of 1024 words each, mapped onto a physical memory of 32 frames. How many bits are there in the physical address and logical address respectively? (4) b) Describe a mechanism by which one segment could belong to the address space of two different processes. (9)	BTL-4	Analyzing
12.	(i) Explain the file access methods (6) (ii) Explain file system mounting (4) (iii)Describe the advantages of File System Mounting (3)	BTL-4	Analyzing
13.	Discuss the given memory management techniques with diagrams. (i)Partition Allocation Methods (7) (ii)Paging and Translation Look-aside Buffer.(6)	BTL-2	Understanding
14.	(i) Consider a computer system with 16 bit logical address and 4KB page size. The system support upto 1 MB of physical memory. Assume that the actual address size is only 33KB,Page table base register contains 1000.and free frame list contains 13,11,9,7,5,3,1,2,4,6,8. Construct physical and logical memory structures, page table of the corresponding process. Find the physical address of 13,256 and another logical address with page number 2 and offset of 128. Discuss about the possible valid-invalid bit and possible protection bits in page table.(8) (ii) Consider a paging system with page table stored in memory (1) If a memory reference takes 50ns how long does a paged memory referenced take? (2) If we add TLB and 75% of all page table reference are found in TLB, what is the effective memory reference time?(Assume that find a page entry in TLB takes 2ns,if entry is present) (5)	BTL-1	Remembering
PART – C			

1.	Consider six memory partitions of size 200 KB, 400 KB, 600 KB, 500 KB, 300 KB and 250 KB. These partitions need to be allocated to four processes of sizes 357 KB, 210 KB, 468 KB and 491 KB in that order. Perform the allocation of processes using- i) First Fit Algorithm ii) Best Fit Algorithm iii) Worst Fit Algorithm	BTL5	Evaluating
2.	(i) Explain in detail about paging in 32-bit and 64-bit architectures (5) (ii) Consider a system that allocated pages of different sizes to its processes. What are the advantages of such a paging scheme? What are modifications to the virtual memory system provide this functionality? (10)	BTL-6	Creating
3.	(i) What is the copy-on-write feature, and under what circumstances is its use beneficial? What hardware support is required to implement this feature? (8) (ii)Consider a system that allocated pages of different sizes to its processes. What are the advantages of such a paging scheme? What are modifications to the virtual memory system provide this functionality? (7)	BTL 6	Creating
4.	(i) Explain the difference between internal and external fragmentation. (7) (ii) Discuss the different file allocation strategies. (8)	BTL4	Analyzing

UNIT IV – PROCESS CREDENTIALS IN LINUX

Process credentials – Traditional unix permission– How unix permission model works – Determining access category– Real and effective IDs.

PART - A

Q.No	Questions	BT Level	Competence
1.	Mr. Jack needs to run a program with an ability to run some (or all) commands at the root level of system operation. What utility does he use?	BTL-5	Evaluating
2.	What is EUID 0?	BTL-4	Analyzing
3.	Show the four integer values associated with the process credentials.	BTL-3	Applying
4.	Smith wants to protect the user's computer from being used as a tool for exploitation. What utility does he use? Explain	BTL-4	Analyzing
5.	List the categories of UNIX file system permissions	BTL-1	Remembering
6.	State the advantages of using Unix permission model.	BTL-3	Applying
7.	Besides other operating systems, why Linux is preferred for development of application problems?	BTL-4	Analyzing
8.	Show the 3 modes of traditional UNIX permissions.	BTL-3	Applying
9.	State the access categories used in the Unix permission model?	BTL-1	Remembering
10.	Recall what is GID and UID?	BTL-1	Remembering
11.	Discuss the purpose of using sudo utility?	BTL-2	Understanding
12.	Identify the significance of ls and chown commands.	BTL-6	Creating
13.	What is setuid-root binary?	BTL-1	Remembering
14.	Summarize the significance of the Identifiers used in the Unix Permission Model.	BTL-2	Understanding
15.	Is running applications as root user a good security practice? Give reason.	BTL-2	Understanding
16.	Define is setuid binary?	BTL-1	Remembering
17.	What are the three ownership classes of users in UNIX?	BTL-1	Remembering

18.	What are Process credentials?	BTL-5	Evaluating
19.	What is Saved set ID?	BTL-6	Creating
20.	Express the need for using credentials in a multiuser system?	BTL-2	Understanding
	PART - B		
1.	How is the traditional Unix security model implemented?	BTL-1	Remembering
2.	a) Is a process with the following user IDs privileged? Explain your answer. real=0 effective=1000 saved=1000 file-system=1000 (4) b) Summarize the interfaces used to change the process credentials. (9)	BTL-6	Creating
3.	Assume in each of the following cases that the initial set of process user IDs is real=1000 effective=0 saved=0 file-system=0. What would be the state of the user IDs after the following calls? a) setfsuid(2000); b) setresuid(–1, 2000, 3000); Give explanation for your answers.	BTL-5	Evaluating
4.	Describe the advantages of implementing a traditional UNIX model. Give a suitable instance of an application.	BTL-1	Remembering
5.	Summarize the concepts of real and effective IDs.	BTL-2	Understanding
6.	Explain with snippets on how to set the process credentials.	BTL-2	Understanding

7.	Assume in each of the following cases that the initial set of process user IDs is real=1000 effective=0 saved=0 file-system=0. What would be the state of the user IDs after the following calls?
	a) setuid(2000);
	b) setreuid(–1, 2000);
	c) seteuid(2000);
	Give explanation for your answers.
		BTL-3	Applying

8.	Illustrate the techniques to run programs with root privileges but without requiring the root password.	BTL-3	Applying
9.	Brief on Saved-set IDs. Give relevant snippets for your answers.	BTL-4	Analyzing
10.	Interpret the ways in which a program can be run using the root privileges?	BTL-2	Understanding
11.	How to set the process credentials? Explain in detail.	BTL-1	Remembering
12.	Smith is in development team. He gets a requirement in developing where he wants to restrict the read, write, and delete operations. Suggest Smith a model, so that his requirements are getting satisfied.	BTL-4	Analyzing
13.	How do you programmatically query the real and effective UIDs /GIDs? Explain in detail.	BTL-4	Analyzing
14.	Describe how sudo works. Give relevant snippets.	BTL-1	Remembering
	PART - C		

1.	Consider you are building an application. You don't want others to read, write, and delete your files. Suggest a reference model for building the application. Develop the implementation of the same.	BTL-6	Creating
2.	Evaluate in detail about the Unix permission model in action.	BTL-5	Evaluating
3.	Name the factors which are used to determine whether the access to a resource (or object) should be allowed or not. Explain the factors in detail.	BTL-4	Analyzing
4.	Recommend some powerful system calls to query and set process credentials.	BTL-5	Evaluating

UNIT V – PROCESS CAPABILITIES IN LINUX

The modern POSIZ capability model – Thread capability sets – File capability sets – Setting capabilities programmatically – Security tips

PART – A

Q.No	Questions	BT Level	Competence
1.	What is the need for using modern capabilities approach rather than the traditional model?	BTL-2	Understanding
2.	Summarize Capability Bitmasks.	BTL-2	Understanding
3.	Identify the significance of getcap utility.	BTL-1	Remembering
4.	Examine what is cred?	BTL-1	Remembering
5.	Distinguish Thread capability sets and File capability sets.	BTL-4	Analyzing
6.	What is Buffer Overflow Attack?	BTL-1	Remembering
7.	State the conditions for an executing program to have no impact on the capsets.	BTL-2	Understanding
8.	Compare and contrast traditional and POSIZ capability model.	BTL-4	Analyzing
9.	What is Discretionary Access Control	BTL-1	Remembering
10.	Write the need for Filecapsets in an application development. State the pre-requisites for the same.	BTL-6	Creating
11.	State the pros of POSIX Capability model.	BTL-2	Understanding
12.	List the Linux File capability sets.	BTL-1	Remembering
13.	What is the need for Container deployment?	BTL-6	Creating
14.	What happens if both the traditional setuid-root and the modern (file) capabilities are embedded in a binary executable?	BTL-3	Applying
15.	Show the command to remove the capabilities of a binary.	BTL-3	Applying
16.	Explain how you will ensure security with APIs, in capability model.	BTL-4	Analyzing
17.	State the set of permissions that define access for the owner, the owning group, and for others in POSIZ capability model.	BTL-5	Evaluating
18.	Explain about the security practice - Principle of Least Privilege (PoLP)	BTL-1	Remembering
19.	What is capability-dumb binary?	BTL-3	Applying
20.	To work with the POSIX capabilities model, highlight the criteria that the OS itself must provide.	BTL-5	Evaluating

PART – B

1.	Summarize modern POSIZ Capabilities model?	BTL-5	Evaluating
2.	Describe the alternatives of using capabilities within a program on a system without file capabilities.	BTL-2	Understanding
3.	Demonstrate how to embed capabilities into a process or binary executable	BTL-3	Applying
4.	i. Discuss Capability dumb binaries with example (9) ii. Explain getcap utility and its significance, with a relevant snippet. (4)	BTL-2	Understanding
5.	Tabulate a table and describe the concept of Permission Models Layering.	BTL-1	Remembering
6.	How to work with capabilities on Linux. Explain its ways.	BTL-1	Remembering
7.	i. Why is POSIZ model superior to the older (traditional) Unix permissions model (2) ii. Compare and contrast the traditional and POSIZ model (4) iii. Explain Linux per-thread capability sets. (7)	BTL-3	Applying
8.	Mr. Smith is developing an application and he doesn't want to compromise on the security features. Smith understands that running applications as root is not a good security practice; and he doesn't want to give root privilege to all his team mates. Develop a working model for Smith.	BTL-6	Creating
9.	From the viewpoint of security, explain the POSIZ Capability Model.	BTL-4	Analyzing
10.	Identify the ways to implement process capabilities via procfs. Explain with code snippets.	BTL-1	Remembering
11.	Summarize some security tips to enhance the security in application development.	BTL-2	Understanding
12.	Explain with a program and show how a process can add or drop capabilities	BTL-4	Analyzing
13.	Pointout the concept of Wireshark. Use relevant snippets to justify your answer.	BTL-4	Analyzing
14.	Describe how to embed the process capabilities into a runtime process.	BTL-1	Remembering
PART – C			
1.	Formulate the modern POSIZ capability model.	BTL-6	Creating
2.	Explain how to embed capabilities into a process or binary executables.	BTL-5	Evaluating
3.	How to work with capabilities on Linux? Explain with snippets.	BTL-4	Analyzing
4.	Explain in detail about the two types of capability sets.	BTL-6	Creating