SRM VALLIAMMAI ENGINEERING COLLEGE

(*An AutonomousInstitution)*

SRM Nagar, Kattankulathur – 603203

DEPARTMENT OF

COMPUTER SCIENCE ANDENGINEERING

QUESTION BANK

I SEMESTER

1912103 –Advanced Operating Systems

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Prepared by

MrS.Venkatesh, Assistant Professor(Sr.G) /CSE

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SUBJECT : 1912103 OPERATING SYSTEM INTERNALS

SEM / YEAR: ISEM/IYEAR

UNIT I-INTRODUCTION

SYLLABUS

Basic Operating System Concepts - Overview of Unix File System – Files - Links - Types – Inodes -Access Rights - System Calls - Overview of Unix Kernels -Model - Implementation - Reentrant Kernels - Address Space - Synchronization and Critical region- Inter process Communication – Process Management - Memory Management - Device Drivers

PART – A (2 Marks)

Q.No	Questions	BT Level	Competence
1.	**Define** an Operating System.	BTL-1	Analyze
2.	**Show** the main goals of an operating system.	BTL-3	Apply
3.	**Explain** the directory structure of a file system in UNIX.	BTL-4	Analyze
4.	Can you **describe** the classification of UNIX File System?	BTL-1	Remember
5.	**Discuss**about Hard and Soft Links in UNIX.	BTL-2	Understand
6.	How would you **describe**aboutinodes and its implications?	BTL-2	Understand
7.	**Quote** the stepsof how to get full permission in LINUX. What is the role of chmod777, 755,644, 666 permissions?	BTL-1	Remember
8.	How would you **tell** briefly about Access Control List?	BTL-1	Remember
9.	**Contrast** the system calls in UNIX and Windows for device manipulations, process control and file manipulations.	BTL-2	Understand
10.	**Label** the features of UNIX Operating Systems.	BTL-1	Remember
11.	**Compare**Linux and Windows.	BTL-2	Understand
12.	**What** is meant by Kernel in UNIX OS and its functions?	BTL-1	Remember
13.	**Demonstrate** the concept of Reentrant kernels.	BTL-3	Apply
14.	**Define**Virtual address Space in LINUX.	BTL-1	Remember
15.	**Summarize** the difference between monolithic and Microkernels.	BTL-4	Analyze
16.	**Illustrate** the need for Kernel Synchronization.	BTL-3	Apply
17.	**Explain**interrupt handling in Linux.	BTL-5	Evaluate

18.	**Compare**UNIX and LINUX.	BTL-5	Evaluate
19.	**Prepare**the steps involved in process management in Linux.	BTL-6	Create
20.	**Formulate**how memory management takes place.	BTL-6	Create
	PART –B(13Marks)		
1.	**(i) Classify**OperatingSystems.(7) **(ii) Explain** in detail InterprocessCommunication in OperatingSystem.(6)	BTL4	Analyze
2.	**(i) Extend** the diagrammatic representationofprocess life cycle.(6) **(ii) Discuss** about UNIXfilesystemBasics.(7)	BTL-2	Understand
3.	**(i) List**theUnixKernels.(7) **(ii) Examine**the implementation of UNIXKernels.(6)	BTL-1	Remember
4.	**(i) Examine**theAccess Rights in Unix File System.(7) **(ii) Examine** thefileinUFS.(6)	BTL-1	Remember
5.	**(i) Deduce**thelinks usedinUFS.(7) **(ii) Evaluate** thepurpose of InodesinUFS.(6)	BTL-5	Evaluate
6.	**Summarize**the model ofUNIX kernels.(13)	BTL-2	Understand
7.	**(i) Quote** thefilesofUFS.(7) **(ii) Examine**System Calls indetail.(6)	BTL-1	Remember
8.	**Show** in detail about memory management techniques.(13)	BTL-3	Apply
9.	(i) How would you **Compose**concept of Synchronization?(7) (ii) **Rewrite** a short noteonDeviceDrivers.(6)	BTL-6	Create
10.	**(i) Explain** the implementation of Unixkernels.(6) **(ii) Pointout**theRentrantKernels.(7)	BTL-4	Analyze
11.	**Infer** the addressSpace,synchronizationindetail. (13)	BTL-4	Analyze
12.	**(i) Demonstrate**the synchronization of kernelpath. (6) **(ii) Demonstrate** the utility of file handling systemcalls.**(7)**	BTL-3	Apply
13.	**Summarize**and explain the issues of memory management.(13)	BTL_2	Understand
14.	**Examine** issues in pagingandvirtualmemory (13)	BTL-1	Remember
	PART-C (15 Marks)		
1	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. **Design** a system is synchronized.	BTL-6	Create
2	**Consider** how access rights are used in a file with some suitable examples**.**	BTL-5	Evaluate

3	Consider the following resource-allocation policy. Requests and releases for resources are allowed at any time. If a request for resources cannot be satisfied because the resources are not available, then we check any processes that are blocked, waiting for resources.**Invent**if they have the desired resources, then these resources are taken away from them and are given to the requesting process. The vector of resources for which the waiting process is waiting is increased the resources that were taken awayandhow memory management takes place here?	BTL-6	Create
4	**Contrast** the techniques used in Linux and Windows.	BTL-4	Analyze

UNITII-PROCESSES

SYLLABUS

Processes, Lightweight Processes, and Threads - Process Descriptor - State - Identifying a Process - Relationships among processes - Organization - Resource Limits - Creating Processes - System Calls - Kernel Threads - Destroying Processes - Termination – Removal- Interruption and Exceptions.

PART –A(2 Marks)

Q.No	Questions	BT Level	Competence
1.	**What**do you mean by the term "processes"?	BTL-1	Remember
2.	**Discover**some of the states in the processes.	BTL-3	Apply
3.	**Illustrate**PCB.	BTL-3	Apply
4.	**Pointout**the relationship among the processes.	BTL-4	Analyze
5.	**Tell** the use of the RPC Mechanism.	BTL-1	Remember
6.	How would you **infer**a thread?	BTL-4	Analyze
7.	How will you **recommend** the idea of process scheduling?	BTL-5	Evaluate
8.	**What** can you say about the functionality of wait queuein kernel?	BTL-1	Remember
9.	**Give**the difference between threads and processes.	BTL-2	Understand
10.	**List** the advantages of using threads.	BTL-1	Remember
11.	**Comparison** between user level threads and kernel levelthreads.	BTL-5	Evaluate
12.	**List** out the implementation of thread mechanism.	BTL-1	Remember
13.	**What** is meant by Multithreading?	BTL-1	Remember
14.	**Generalize** the role of a process descriptor.	BTL-6	Create
15.	How would you **explain**the process identification?	BTL-4	Analyze

16.	**Discuss**Interrupt Handler.	BTL-2	Understand
17.	Can you **formulate**Context switching?	BTL-6	Create
18.	**Demonstrate** the Resource Limits and why does Linux Kernel implements it?	BTL-3	Apply
19.	**Summarize** the process life cycle.	BTL-2	Understand
20.	**Predict** the role of process scheduler.	BTL-2	Understand
	PART – B (13 Marks)		
1.	(i) **List** thedetailsofPCB.(6) (ii) **Examine** the differentstatesofprocess.(7)	BTL1	Remember
2.	**Discuss** in detail about the architecture of Process DescriptortaskManagement.(13)	BTL2	Understand
3.	How would you **tell** about organization of processes? Givean example.(13)	BTL1	Remember
4.	(i)With neat diagrams **examine** the user's and the kernelsthreads(6) (ii)**Illustrate** how processes are in relationship witheach other using a suitable example.(7)	BTL3	Apply
5.	**Express** the concept of System Calls and how it is used to createtheprocesses. (13)	BTL2	Understand
6.	**Describe** in detail about Process Identification with suitable illustration.(13)	BTL1	Remember
7.	**Demonstrate** the concept of Resource limits in Linux Kernel. (13)	BTL3	Apply
8.	**(i) Contrast**User Level and Kernel LevelThreads(6) **(ii) Associate** the**above**withProcessManagement.(7)	BTL2	Understand
9.	(i) How would you **classify**important functions ofan Operatingsystem?(6) (ii) **Relate**theaboveanytwoproblemsindetailwith suitable examples.(7)	BTL3	Apply
10.	How would you **measure** the performance of the processes with respect to the task scheduling?(13)	BTL5	Evaluate
11.	**Tell** about the following:- (i) Creatingaprocess(4) (ii) Schedulingaprocess(4) (iii) Destroyingaprocess(5)	BTL1	Remember
12.	**Point out** the concept of Light Weight and Heavyweight processes withsomesuitableexamples. (13)	BTL4	Analyze
13.	**(i) Infer**aboutProcesses andtheirtasks.(7) **(ii) Explain**about ProcessTermination,removal (6)	BTL4	Analyze
14.	Explain in detail about organization in the processes.(13)	BTL4	Analyze

PART-C(15 Marks)			
1	Develop a suitable example for Process Scheduling and how it is carried out.	BTL6	Create
2	Explain in detail about process Synchronization with a suitable example..	BTL4	Analyze
3	How will you **consider** and measure Process Control Block in terms of CPU scheduling, I/O resource Management, File Management.	BTL5	Evaluate
4	How will you **Design**schedulers in the order of their tasks. Justify your reply with suitable example?	BTL6	Create

UNIT III - FILE SYSTEM

SYLLABUS

The Virtual File System (VFS) - Role - File Model -System Calls - Data Structures - Super Block, Inode, File, dentry Objects - dentry Cache - Files Associated with a Process - File system Types - Special File systems – File system Type Registration – File system Handling - Namespaces - Mounting – Un mounting - Implementation of VFS SystemCalls.

PART – A (2 Marks)

Q.No	Questions	BTL	Competence
1	**Generalize** the two important services present in Virtual File System.	BTL6	Create
2	**What** is Virtual File System?	BTL1	Remember
3	**What**do you mean by File Model?	BTL1	Remember
4	**Tell**how system call contributes to providing better service in terms of accessing service ?	BTL1	Remember
5	What is the **difference** between a structured and unstructured file model?	BTL2	Understand
6	**What** do you mean by the file attributes?	BTL1	Remember
7	**Tabulate** the difference between remote service model and Data caching model.	BTL1	Remember
8	**Explain**the use of immutable files.	BTL4	Analyze
9	**Show**the uses of mutable files.	BTL3	Apply
10	**When**will you use a system call?	BTL1	Remember
11	**Explain**Superblock ,inode, dentry file**.**	BTL4	Analyze
12	**Compare**System call and an interrupt.	BTL5	Evaluate
13	**Examine**the file system types.	BTL3	Apply

14	**Which** data structure would be best to recommend to implement a file system structure?	BTL5	Evaluate
15	**Pointout**the files associated with active process items.	BTL4	Analyze
16	**Rearrange** the tasks of File System Mounting.	BTL6	Create
17	**Summarize**the system calls for VFS.	BTL2	Understand
18	How would you **describe**Namespaces?	BTL2	Understand
19	**Interpret**Dentry cache.	BTL2	Understand
20	How would you **examine**File System Type registration?	BTL3	Apply
	PART-B (13 Marks)		
1	**Illustrate** in detail about VFS Data Structures.(13)	BTL3	Apply
2	**(i) Generalize** about design issues in distributed resourcemanagement.(6) **(ii) Formulate**eachissuewithexamples**.(7)**	BTL6	Create
3	(i) **Show** the importance of Disk-basedFileSystems.(6) (ii) **Demonstrate**the useofsuperblock objects. (7)	BTL3	Apply
4	**(i) Summarize**the states ofDentryObjects.(7) **(ii) Explain** the order of the methods appearing in dentry operationstable.(6)	BTL5	Evaluate
5	**Describe** the methodsassociatedwith an inode object. (13)	BTL2	Understand
6	**(i) Infer** the fields of fs_structStructure.(6) **(ii)Pointout**theroleofdo_kern_mount().(7)	BTL4	Analyze
7	**Describe** the steps for mounting a generic file system. (13)	BTL2	Understand
8	**(i) List** Implementation of VFS System Calls(7) **(ii) Describe** indetailaboutnamespaces.(6)	BTL1	Remember
9	**(i) Tabulate**the roles of read() and write() Virtual filesystemcalls.(7)	BTL1	Remember
10	**Examine**the actions performed while unmounting a file system.	BTL1	Remember
11	**(i)Analyze**files associated withaprocess.(6) **(ii)InferS**pecialFilesystems. (7)	BTL4	Analyze
12	**Explain** the concept of mouting and unmountingfilesystem.(13)	BTL4	Analyze
13	How willyou**classify**FileSystems? (13)	BTL3	Apply
14	(i)**Tell**indetailaboutdentrycache. (6) (ii) **Describe**FileSystemTypeHandling.(7)	BTL1	Remember

PART-C(15 Marks)			
1	**Generalize** the actions dentry objects consisting of different fields using different sub-functions.	BTL-6	Create
2	**Pointout**themost common special file systems.	BTL-4	Analyze
3	**Deduce** how File System Type registration takes place.	BTL-5	Evaluate
4	**Invent**how the VFS system calls helps in creating a proper interface between an operating system's kernel and a more concrete file system.	BTL-6	Create

UNIT IV –DISTRIBUTED SYSTEM

SYLLABUS

Advantages of Distributed system – Types of network based operating system – Network structure – Communication structure – Communication protocols – An Example: TCP/IP – Robustness – Design Issues.

PART – A (2 Marks)

Q.No	Questions	BTL	Competence
1	**What** are the advantages of Distributed Systems?	BTL1	Remember
2	**Tell** the purpose of resource sharing.	BTL1	Remember
3	**Identify** the use of load sharing.	BTL1	Remember
4	**Describe**the process of reliability.	BTL1	Remember
5	**List** out the types of network based operating systems.	BTL1	Remember
6	**Identify**the function of remote file transfer.	BTL1	Remember
7	**Summarize**on Data Migration.	BTL2	Understand
8	**Analyze** the process of computation Migration	BTL4	Analyze
9	**Evaluate**the reasons for the utilization of process migration.	BTL5	Evaluate
10	**Differentiate** Location Transparency and Location Independence	BTL2	Understand
11	**Design the** issues addressed by communication network.	BTL6	Create
12	**Explain**Naming and Transparency	BTL3	Apply
13	**Infer**how recovery is done from failure.	BTL4	Analyze
14	How would you **design**Java Program to illustrate DNS Lookup.	BTL6	Create
15	**Give** the various Routing Strategies.	BTL2	Understand
16	How would you **assess** Packet Strategies and Connection Strategies?	BTL5	Evaluate
17	Can you **discuss** the purpose of TCP and UDP?	BTL2	Understand

18	What can you **explain** about ARP and RARP?	BTL4	Analyze
19	**Applythe purpose** and drawandiagramof Ethernet packet.	BTL3	Apply
20	**Discuss**about Distributed File system.	BTL2	Understand
	PART – B (13 Marks)		
1	**Discuss** on the various Types of Network Based Operating Systems.	BTL2	Understand
2	**(i) Summarize** LANandWAN. (6) **(ii) Assess** the role ofProcess Migration.(7)	BTL5	Evaluate
3	**(i) Explain** the concept ofNaming and Name Resolution(6) **(ii) Analyze the** different routingstrategies.(7)	BTL4	Analyze
4	**Illustrate**in detail OSI Network protocol stack with diagram.(13)	BTL3	Apply
5	**(i) Discuss** with example theTCP/IP.(6) **(ii) Associate** how recovery from failure isperformed.(7)	BTL2	Understand
6	**Generalize the** several design issues addressed by Distributed Systems.	BTL6	Create
7	**(i) Explain**the purpose of NamingandTransparency. (6) **(ii) Analyze**the use of Remote FileAccess(7)	BTL4	Analyze
8	**Explain in** detail the caching schemes and caching policy in DFS.	BTL1	Remember
9	**(i) Identify**the two approaches to verify the validity of cached data(7) **(ii) List** the advantages of main memorycaches.(6)	BTL1	Remember
10	**Describe** with necessary examples the communication protocol of Distributed Systems.(13)	BTL1	Remember
11	**Show**withexample TCP/IP is used in Distributed environment.(13)	BTL3	Apply
12	**(i) List** the various Design issues of Distributedsystems.(6) **(ii) Describe** the concept of Robustness in DistributedSystem**.(7)**	BTL1	Remember
13	Explain how Different Network Structure is **applied** in Distributed System and elaborate on OSI protocol stack.(13)	BTL3	Apply
14	**Analyze the** implementation of Distributed File System with necessarydiagrams. (13)	BTL4	Analyze
	PART-C(15 Marks)		
1	What is the **difference** between computation migration and process migration? Which is easier to implement, and why?.	BTL-4	Analyze
2	The lower layers of the OSI network model provide datagram service, with no delivery guarantees for messages. A transport-layer protocol such as CP is used to provide reliability. Discuss the advantages and disadvantages of supporting reliable message delivery at the lowest possiblelayer.	BTL-6	Create
3	Discuss whether OpenAFS and NFS provide the following: (a) location transparency and (b) locationindependence.	BTL-6	Create
4	**Conclude**the benefits of a DFS compared with a file system in a centralized system.	BTL-5	Evaluate

UNIT V –PROTECTION AND SECURITY

SYLLABUS

Goals of protection – Principles of protection – Domain of protection – Access matrix – Implementation of access matrix. The Security problem – Program threats – System and network threats – Cryptography as a security tool – User authentication – Implementing security defenses - Firewalling to protect systems and networks.

PART – A (2 Marks)

Q.No	Questions	BTL	Competence
1	**What** are the goals of Protection?	BTL1	Remember
2	**Demonstrate** the use of message authentication code.	BTL3	Apply
3	**What** are the ways in which domain can be realized?	BTL1	Remember
4	**Show** the implementation of access matrix.	BTL3	Apply
5	**Explain**the ways in which the capabilities are distinguished.	BTL4	Analyze
6	**Describe**the Lock-Key Mechanism.	BTL1	Remember
7	**What** is Firewall?	BTL1	Remember
8	**Tabulate** the advantages of Compiler Based Enforcement.	BTL1	Remember
9	**Examine**the Denial of Service.	BTL1	Remember
10	**Explain**Language Based Protection.	BTL4	Analyze
11	**Discuss** on Breach of integrity and confidentiality.	BTL2	Understand
12	**Predict** the purpose of principle of least privilege.	BTL2	Understand
13	**Discuss** on Confinement problem.	BTL2	Understand
14	**Generalize**the implementation methods of access matrix.	BTL6	Create
15	**Evaluate**the security measures taken at four levels.	BTL5	Evaluate
16	**Show**how trap door security breach is done?	BTL3	Apply
17	**Summarize**on worms.	BTL5	Evaluate
18	**Compare** Symmetric and Asymmetric encryption.	BTL6	Create
19	**Classify** the categories of viruses.	BTL4	Analyze
20	**Predict** the function of virus dropper.	BTL2	Understand
	PART – B (13 Marks)		
1	**Design the** Cryptography methods used as a tools for security purpose. (13)	BTL6	Create
2	**Examine** the need for rights amplification in Hydra. How does this practice compare with the cross-ring calls in a ring-protection scheme?	BTL3	Apply
3	(i) **Evaluate the** two advantages of encrypting data stored in the computersystem.(6) (ii) **Summarize on** commonly used computer programs are prone to man-in-the-middle attacks? Discuss solutions for preventingthis form of attack**.**(7)	BTL5	Evaluate

4	**Analyze** how firewall **is** used to protect systems and Networks.(13)	BTL4	Analyze
5	Explain the strengths and weaknesses of implementing an access matrix using capabilities that are associated with domains (13)	BTL4	Analyze
6	(i) Compare the several program threats and how they are prevented.(6) (ii) **Formulate** how the viruses belonging to more than one category function?**(**7)	BTL6	Create
7	Extend how different encryption techniques solves the variety of communication security problem? Explain in Detail.(13)	BTL2	Understand
8	**(i) Describe**in detail Symmetricencryption.(6) **(ii) Describe** in Asymmetricencryption.(7)	BTL1	Remember
9	**How** does the principle of least privilege aid in the creation of protection systems?(13)	BTL1	Remember
10	**(i) Tabulate**the key features ofCryptographyimplementation.(6) **(ii)Compare** the different user authenticationtechniques.(7)	BTL1	Remember
11	**Explain the** techniques used to implement the security defenses. (13)	BTL2	Understand
12	**(i) Estimate**the countermeasures taken to securityattack.(7) **(ii)Interpret** the different security threats and attacks(6)	BTL2	Understand
13	**Explain**Firewalling to Protect Systems and Networks (13)	BTL4	Analyze
14	Apply how the fundamentals of encryption, authentication, and hashing in enhancing the security features.	BTL3	Apply
PART-C (15 Marks)			
1	Buffer-overflow attacks can be avoided by adopting a better programming methodology or by using special hardware support. **Analyze** thesesolutions.	BTL4	Analyze
2	What commonly used computer programs are prone to man-in-the-middle attacks? **Evaluate** solutions for preventing this form of attack.	BTL-5	Evaluate
3	Consider a computing environment where a process is given theprivilege of accessing an object onlyntimes. **Suggest** a scheme forimplementing this policy.	BTL-6	Create
4	**Compare the** Unix System and **MULTICS**system that describes the different protection scheme.	BTL-6	Create