INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

INFORMATION TECHNOLOGY
TUTORIAL QUESTION BANK

Course Name	:	LINUX INTERNALS
Course Code	:	AIT005
Class	:	III B. Tech II Semester
Branch	:	INFORMATION TECHNOLOGY
Year	:	2019- 20
Course Coordinator	:	Mr. A. Krishna Chaitanya, Assistant Professor, IT
Course Faculty	:	Mr D. Rahul, Assistant Professor, IT

COURSE OBJECTIVES (COs):
The course should enable the students to:

I	Familiarize students with the Linux environment, and able to run commands on a standard Linux operating system.
II	Provide the skills needed to develop and customize Linux shell programs and to make effective use of a wide range of standard Linux programming and development tools.
III	Able to write moderate C programs utilizing common system calls.
IV	Develop the skills necessary for system programming and inter and intra process communication programming.

COURSE OUTCOMES (COs):

	The course should enable the students to:
I	Understand the basic commands of linux operating system and can write shell scripts.
II	Create file systems and directories and operate those using programs.
III	Understand the processes background and fore ground by process and signals system calls.
IV	Create shared memory segments, pipes, message queues and can exercise inter process communication.
V	Create sockets and semaphores to interact between process of different system.

COURSE LEARNING OUTCOMES:
Students, who complete the course, will have demonstrated the ability to do the following.

S. No	Description
AIT005.01	Learn the importance of Linux architecture along with features.
AIT005.02	Identify and use Linux utilities to create and manage simple file and text processing operations.
AIT005.03	Develop shell scripts to perform more complex tasks in shell programming environment.
AIT005.04	Illustrate file processing operations such as standard I/O and formatted I/O.

AIT005.05	Illustrate memory management of file handling through file/region lock.
AIT005.06	Design and Implement in C some standard linux utilities.
AIT005.07	Understand process structure, scheduling and management through system calls.
AIT005.08	Implement C programs to control process using system calls and identify difference between process and threads.
AIT005.09	Generalize signal functions to handle interrupts by using system calls.
AIT005.10	Design and implement inter process communication (IPC) in client server environment by using pipes and named pipes system calls.
AIT005.11	Design and implement inter process communication (IPC) in client server environment by using message queues systems calls.
AIT005.12	Illustrate client server authenticated communication in IPC through shared memory.
AIT005.13	Familiarity with Inter Process Communication using Semaphores.
AIT005.14	Demonstrate various client server applications on network using TCP or UDP protocols.
AIT005.15	Design custom based network applications using the Sockets Interface in heterogeneous platforms.

3= High; 2 = Medium; 1 = Low

S No	QUESTIONS	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes
	UNIT – I **Part - A (Short Answer Questions)**			
1.	What is the need of Open Source Systems?	Remember	CO 1	AIT005.1
2.	State kernel role in Linux?	Remember	CO 1	AIT005.1
3.	Give the vi editor text editing commands?	Remember	CO 1	AIT005.1
4.	Find the list of files in a directory along with file attributes.	Understand	CO 1	AIT005.2
5.	Define hard link and soft link of a file.	Understand	CO 1	AIT005.2
6.	What is 'rlogin' command purpose?	Remember	CO 1	AIT005.2
7.	Give the use of 'telnet' command with example?	Remember	CO 1	AIT005.2
8.	Differentiate tar and zip/unzip commands?	Remember	CO 1	AIT005.2
9.	List the errors while deleting a directory with suitable examples.	Remember	CO 1	AIT005.2
10.	Compare cp and mv commands.	Understand	CO 1	AIT005.2
11.	What is ftp and its importance in Unix?	Understand	CO 1	AIT005.2
12.	How to create a new directory in a specific location in Linux with example?	Understand	CO 1	AIT005.2

13.	How will you check the length of a line from a text file using sed command?	Remember	CO 1	AIT005.2
14.	Explain grep family commands.	Remember	CO 1	AIT005.2
15.	List different types of shells in Linux	Understand	CO 1	AIT005.2
16.	What are positional parameters?	Remember	CO 1	AIT005.2
17.	Describe any four built in variables in Shell with example?	Understand	CO 1	AIT005.3
18.	What is the use of here documents?	Remember	CO 1	AIT005.3
19.	Write a shell script to display GOOD MORNING, GOOD AFTERNOON, GOOD NIGHT based on system time whenever user logs on.	Remember	CO 1	AIT005.3
20.	Describe the Debugging process in shell	Understand	CO 1	AIT005.3
Part - B (Long Answer Questions)				
1.	Describe Layered architecture and kernel role in Linux with neat Diagram?	Understand	CO 1	AIT005.1
2.	List different operating systems. Differentiate between windows and Linux operating systems in details.	Remember	CO 1	AIT005.1
3.	Compare the comm, cmp and diff text processing utilities.	Understand	CO 1	AIT005.2
4.	Illustrate the file filter commands with examples	Remember	CO 1	AIT005.2
5.	Remember about links of files and describe about kernel role while creating links.	Understand	CO 1	AIT005.2
6.	Describe the issues with creating, copying, moving and deleting the directory file in linux with examples.	Remember	CO 1	AIT005.2
7.	Differentiate stream editor and line editor	Understand	CO 1	AIT005.2
8.	How to create background job and foreground jobs in Linux? Explain Moving processes to the background and foreground with an example?	Remember	CO 1	AIT005.2
9.	Describe about ulimit, finger, wc and mount commands?	Remember	CO 1	AIT005.2
10.	Distinguish between user defined variables and environment variables with example?	Understand	CO 1	AIT005.2
11.	Discuss on sed script, operation, addresses with examples.	Remember	CO 1	AIT005.2
12.	Write an awk script to find the number of characters, words and lines in a file.	Understand	CO 1	AIT005.2

13.	Write sed commands to
	   i. Replacing the 2nd occurrence of a pattern unix with linux in a line of given file.
	   ii. Delete 1 to 15 lines of given file emp.txt.
	   iii. Display range of lines from 20 to 35 of given
		Remember	CO 1	AIT005.2

	file stud.txt			
14.	Describe about I/O Redirection operations, built in variables in Shell.	Remember	CO 1	AIT005.3
15.	Describe by writing shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory?	Understand	CO 1	AIT005.3
16.	Illustrate how the shell treat a command line passed to it.	Remember	CO 1	AIT005.3
17.	Write a shell script to find and delete all files with the word "Unix".	Remember	CO 1	AIT005.3
18.	Write a shell script to count the specified number of lines in a text file without using wc command?	Remember	CO 1	AIT005.3
19.	Demonstrate by writing a shell script to find the factorial of a given number.	Understand	CO 1	AIT005.3
20.	Illustrate by writing shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory?	Remember	CO 1	AIT005.3
<td colspan="4">**Part - C (Problem Solving and Critical Thinking Questions)**</td>				
1.	List different operating systems. Differentiate between windows and Linux operating systems in detail.	Remember	CO 1	AIT005.1
2.	What stateless linux server? What feature it offers?	Remember	CO 1	AIT005.1
3.	What utility would you use to cut off the first column in a text file?	Understand	CO 1	AIT005.2
4.	What command would you use to create an empty file without opening it to edit it?	Remember	CO 1	AIT005.2
5.	Illustrate security concepts in both Linux and windows operating Systems?	Understand	CO 1	AIT005.2
6.	Write a SED command to print the lines that do not contain the word "complex"?	Understand	CO 1	AIT005.2
7.	Illustrate by writing script, that will print, Message "Hello World", in Bold and Blink effect, and in different colors like red, brown etc using echo command.	Understand	CO 1	AIT005.3
8.	Describe the Debugging process in shell	Understand	CO 1	AIT005.3

9.	Write shell script to show various system configuration like
	  1) Currently logged user and his logname
	  2) Your current shell
	  3) Your home directory
	  4) Your operating system type
	  5) Your current path setting
	  6) Your current working directory
		Understand	CO 1	AIT005.3

10.	Write script to print given number in reverse order, for eg. If no is 123 it must print as 321.	Understand	CO 1	AIT005.3
11.	Write a script to print the first 10 elements of Fibonacci series.	Understand	CO 1	AIT005.3

	UNIT – II **Part – A (Short Answer Questions)**			
1.	Differentiate between a file locking and record locking.	Remember	CO 2	AIT005.5
2.	Differentiate symlink( ) and link() functions with example?	Understand	CO 2	AIT005.5
3.	Define a system call?	Remember	CO 2	AIT005.4
4.	List the file types supported by linux.	Understand	CO 2	AIT005.4
5.	Differentiate system call with library function?	Remember	CO 2	AIT005.4
6.	Compare dot and dot dot notations in the file system?	Remember	CO 2	AIT005.4
7.	Distinguish relative path and absolute path.	Understand	CO 2	AIT005.4
8.	List the significance of fcntl() arguments	Understand	CO 2	AIT005.5
9.	How to change owner name and group name using system calls?	Remember	CO 2	AIT005.4
10.	Give the list of directory API functions	Understand	CO 2	AIT005.4
11.	Write the syntax for conditional statements in Linux?	Understand	CO 2	AIT005.4
12.	Discuss three standard streams in Linux	Remember	CO 2	AIT005.4
13.	Discuss the two components of the directory file?	Remember	CO 2	AIT005.4
	Part - B (Long Answer Questions)			
1.	Write a program to create, read and write the contents of directory File Using directory API.	Remember	CO 2	AIT005.4
2.	Illustrate about symlink ( ) function with example? Explain about link( )function with example?	Understand	CO 2	AIT005.5
3.	Write a program to create, read and write the contents of Ordinary file using file API.	Remember	CO 2	AIT005.6
4.	Illustrate about unlink( ) functions with example? Explain about symlink( ) functions with example?	Understand	CO 2	AIT005.6
5.	Emulate the nl command using file API	Remember	CO 2	AIT005.6
6.	Define fcntl( ), read(), write() and writen() function with examples?	Remember	CO 2	AIT005.6
7.	Explain File System structure directories.	Understand	CO 2	AIT005.4
8.	Describe about Low Level File I/O System Calls.	Remember	CO 2	AIT005.4
9.	Describe usage of dup() and dup2() system calls with example?	Remember	CO 2	AIT005.4
10.	Define lseek(), chmod and create() function with examples?	Understand	CO 2	AIT005.4
11.	Describe scanning directories functions in Linux with examples?	Remember	CO 2	AIT005.4

12.	Differentiate stat( ), fstat( ) and lstat() with example?	Understand	CO 2	AIT005.4
Part – C (Problem Solving and Critical Thinking)
1.	Differentiate file API and standard library functions for file operations.	Understand	CO 2	AIT005.4
2.	Emulate the ls command using file API.	Remember	CO 2	AIT005.6
3.	Illustrate to read input from the standard input (stdin) and display on the standard output (stdout) using file API.	Understand	CO 2	AIT005.6
4.	Emulate the wc command using file API	Remember	CO 2	AIT005.6
5.	List and briefly describe the functionalities of standard i/o library.	Remember	CO 2	AIT005.4
6.	Differentiate between the following terms: a) getc( ) vs fgetc( ) b) stat( ) vs fsat( ) c) printf( ) vs fprint( ) d) scanf( ) vs fsca	Understand	CO 2	AIT005.4
7.	Write a program that takes one or more file name as command line input and reports the following information on the file. i. File type. ii. Number of links. iii. Time of last access.	Remember		AIT005.4
8.	How do you list all files in a directory, including the hidden files?	Understand	CO 2	AIT005.6
9.	Emulate the cat command using file API	Remember	CO 2	AIT005.6
10.	Explain about memory management functions malloc(), calloc(), realloc(), free() with suitable example.	Understand	CO 2	AIT005.4
UNIT-III **Part - A (Short Answer Questions)**
1.	What is a process? Explain process states.	Remember	CO 3	AIT005.7
2.	How do you get parent and current process identification number?	Remember	CO 3	AIT005.7
3.	List the process attributes.	Understand	CO 3	AIT005.7
4.	Describe orphan process with example?	Remember	CO 3	AIT005.7
5.	What is fork() with example?	Understand	CO 3	AIT005.7
6.	Define zombie processes with example?	Remember	CO 3	AIT005.7
7.	Write the differences between threads and processes.	Understand	CO 3	AIT005.8
8.	What is process ID of init, daemon process?	Understand	CO 3	AIT005.7
9.	How to get/set an Environment Variable using system calls?	Remember	CO 3	AIT005.7

10.	Differentiate fork() and vfork() with example?	Remember	CO 3	AIT005.7
11.	Define deadlock?	Remember	CO 3	AIT005.7
12.	Explain about reliable signals.	Remember	CO 3	AIT005.9
13.	Describe exec() with example?	Remember	CO 3	AIT005.7
14.	How to terminate the process in linux system?	Understand	CO 3	AIT005.7
15.	Illustrate exit( ) function?	Understand	CO 3	AIT005.7
16.	Discuss a unreliable signals	Understand	CO 3	AIT005.9
17.	Write about signal sets	Understand	CO 3	AIT005.9
18.	Distinguish between alarm(), sleep(), pause() functions?	Understand	CO 3	AIT005.9
19.	Write the difference between reliable and unreliable signals.	Remember	CO 3	AIT005.9
20.	Illustrate how to handle signal?	Understand	CO 3	AIT005.9
21.	How a user can generate SIGKILL signal?	Understand	CO 3	AIT005.9
22.	What is meant by Interrupt?	Understand	CO 3	AIT005.9
Part – B (Long Answer Questions)				
1.	Write a program to find sum of n numbers by child process and fibonacci series by parent processes of given number using fork function.	Understand	CO 3	AIT005.8
2.	Discuss about orphan process and zombie process with example?	Understand	CO 3	AIT005.8
3.	Explain how to terminate process normally or abnormally?	Remember	CO 3	AIT005.8
4.	What is process table and describe the Process States In Linux?	Remember	CO 3	AIT005.8
5.	List the system calls used for process management	Understand	CO 3	AIT005.8
6.	Write a C program to create a child process and allow the parent to display "parent" and the child to display "child" on the screen.	Remember	CO 3	AIT005.8
7.	Write a c program that accepts two small numbers as arguments and then sums the two numbers in a child process. The sum should be returned by child to the parent as its exit status and the parent should print the sum?	Remember	CO 3	AIT005.8
8.	Differentiate wait () and waitpid() with examples?	Understand	CO 3	AIT005.8

9.	Write about the kill() and raise() signal functions.	Remember	CO 3	AIT005.9
10.	Illustrate the mechanism for handling a signal with example?	Remember	CO 3	AIT005.9
11.	How many ways a process goes to wait state or termination state Forcefully.	Understand	CO 3	AIT005.9
12.	What are the signals that are not ignored or blocked? Explain the reason behind it with an example.	Understand	CO 3	AIT005.9
13.	Write about signal () function? Differentiate the reliable and unreliable signals	Understand	CO 3	AIT005.9
14.	Write the syntax of six versions of exec functions and also explain how these functions differ from each other.	Remember	CO 3	AIT005.9
15.	Explain how to terminate process normally or abnormally?	Understand	CO 3	AIT005.9
Part – C (Problem Solving and Critical Thinking)			
1.	Differentiate and analyze non-blocking IO operations in both Windows and Linux operating systems?	Understand	CO 3	AIT005.7

2.	Predict the output of the following program code
	main()
	{
	fork(); fork(); fork();
	printf("hello world!");
	}
		Understand	CO 3	AIT005.7

3.	Illustrate by writing c program where process forks to a child, then Waits for someone to terminate?	Understand	CO 3	AIT005.8
4.	Write a program to create a child process and get the processed of child and parent.	Remember	CO 3	AIT005.8
5.	Write a program to find sum of odd numbers by child process and sum of even numbers by parent processes of given range numbers using fork function	Remember	CO 3	AIT005.8
6.	Explain the below system calls with the help of syntax and examples: a) kill b) raise c) alarm d) pause e) abort	Remember	CO 3	AIT005.9
7.	Differentiate the advantages of waitpid( ) over wait( ).	Remember	CO 3	AIT005.9
8.	What are the signals that are not ignored or blocked? Explain the reason behind it with an example.	Understand	CO 3	AIT005.9
9.	Write a C program that illustrates suspending and resuming processes using signals	Remember	CO 3	AIT005.9
10.	Write a C program to catch signal SIGINT and display message "hello you are interrupted" after pressing ctrl + c, catch signal using signal handler function.	Remember	CO 3	AIT005.9
UNIT-IV **Part – A (Short Answer Questions)**			
1.	What is Inter Process Communication?	Understand	CO 4	AIT005.10
2.	List out the different mechanisms of Inter Process Communication.	Remember	CO 4	AIT005.10

3.	Describe pipe () system call?	Remember	CO 4	AIT005.10
4.	Describe pipes? Explain their limitations.	Remember	CO 4	AIT005.10
5.	Describe popen and pclose concept with example?	Understand	CO 4	AIT005.10
6.	Describe FIFO concept with example?	Remember	CO 4	AIT005.10
7.	What is the use of FIFO comparing with pipe?	Understand	CO 4	AIT005.10
8.	List the message queue API system calls to create, delete, send and receive.	Understand	CO 4	AIT005.11
9.	Describe the structure of a message in message queues.	Remember	CO 4	AIT005.11
10.	Illustrate briefly about IPC_EXEC, IPC _PRIVATE flags.	Understand	CO 4	AIT005.11
11.	List out the POSIX APIs of Semaphores.	Understand	CO 4	AIT005.13
Part – B (Long Answer Questions)				
1.	Differentiate pipe and named pipe concepts in IPC process.	Understand	CO 4	AIT005.10
2.	Illustrate pipes? Explain their limitations. Explain how named pipes are replaced to overcome the drawback of pipe in IPC with an Examples.	Remember	CO 4	AIT005.10
3.	Create a FIFO to build the communication channel between two different processes.	Understand	CO 4	AIT005.10
4.	Describe message queue API with syntax and example?	Remember	CO 4	AIT005.11
5.	Illustrate about V IPC semaphore mechanism with example.	Remember	CO 4	AIT005.13
6.	Describe about synchronization and how synchronization is achieved with Semaphores?	Understand	CO 4	AIT005.13
Part – C (Problem Solving and Critical Thinking)				
1.	Illustrate to redirect the standard input (stdin) and the standard output (stdout) of a process, so that scanf () reads from the pipe and printf () writes into the pipe?	Understand	CO 4	AIT005.10
2.	Write a c program to send and receive message using pipes. Implement two way communication using pipes.	Remember	CO 4	AIT005.11
3.	Demonstrate the priority message queues with example using Message Queue API.	Understand	CO 4	AIT005.11
4.	Illustrate to displays no of messages in queue, last message send, last message read time in a given message queue.	Remember	CO 4	AIT005.11
5.	Write a C program to create a message queue with read and write permissions to write 3 messages to it with different priority numbers.	Remember	CO 4	AIT005.11
6.	Write a C program that receives 3 messages from the sender using message queues system calls and displays messages to output stream based on priority.	Remember	CO 4	AIT005.11

7.	Write thread synchronization with semaphores with example.	Remember	CO 4	AIT005.13
8.	Illustrate about Semaphores with examples.	Understand	CO 4	AIT005.13

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UNIT-V
Part - A (Short Answer Questions)

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1.	Demonstrate race conditions with shared memory.	Understand	CO 5	AIT005.12
2.	Illustrate the system functions associated for creating and Destroying a shared memory.	Remember	CO 5	AIT005.12
3.	Demonstrate client and server programming using TCP protocol.	Remember	CO 5	AIT005.14
4.	Describe about socket( ) function in Linux.	Remember	CO 5	AIT005.14
5.	Demonstrate about accept( ) function in Linux.	Understand	CO 5	AIT005.14
6.	Describe about bind( ) function in Linux.	Remember	CO 5	AIT005.14
7.	Differentiate stream sockets and raw sockets.	Remember	CO 5	AIT005.14
8.	Demonstrate client and server programming using UDP protocol.	Understand	CO 5	AIT005.14
9.	Write primitive is used by server for waiting the client connection requests.	Remember	CO 5	AIT005.15
10.	Draw the structure of TCP/IP for exchange information between client and server.	Remember	CO 5	AIT005.14
11.	List the attributes in socket address functions.	Remember	CO 5	AIT005.14
12.	Distinguish between IPV4 and IPV6 protocols.	Understand	CO 5	AIT005.15

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Part - B (Long Answer Questions)

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1.	Describe about shared-memory segment to overcome the Drawback of message queue with example.	Understand	CO 5	AIT005.12
2.	Discuss the structure of a shared memory and kernel data structure with a neat diagram?	Remember	CO 5	AIT005.12
3.	Illustrate TCP socket connection establishment with a neat diagram?	Remember	CO 5	AIT005.14
4.	Illustrate UDP data transfer with a neat diagram.	Understand	CO 5	AIT005.14
5.	Illustrate about bind (), read(), write() functions in Linux.	Remember	CO 5	AIT005.14
6.	Demonstrate about sendto() and recvfrom() functions in Linux.	Remember	CO 5	AIT005.14
7.	Illustrate about TCP NODELAY syntax with a small program.	Understand	CO 5	AIT005.14
8.	Demonstrate all byte ordering and manipulation functions with Examples?	Remember	CO 5	AIT005.14
9.	Demonstrate about socket () , listen(), accept( )system calls in Linux?	Remember	CO 5	AIT005.14
10.	Illustrate about how TCP connections are established and terminated.	Understand	CO 5	AIT005.14

11.	Demonstrate echo server and echo client using 6666 port in TCP style?	Remember	CO 5	AIT005.14
Part – C (Problem Solving and Critical Thinking)			
1.	Illustrate by writing a program to implement UDP chat client server?	Understand	CO 5	AIT005.14
2.	Demonstrate client and server programming using UDP protocol with neat diagram?	Understand	CO 5	AIT005.14
3.	Differentiate between TCP and UDP protocols	Understand	CO 5	AIT005.15
4.	Illustrate by writing a c program to implement TCP chat client server?	Remember	CO 5	AIT005.14
5.	Differentiate stream sockets and raw sockets and related system calls?	Remember	CO 5	AIT005.14
6.	Over the socket? is there a way to have a dynamic buffer? What does one do when one does not know how much information is coming?	Understand	CO 5	AIT005.14
7.	Explain address structure of IPV4 and IPV6 in sockets	Understand	CO 5	AIT005.14
8.	Write a program to implement TCP client server application in which client takes an Integer value from the command line and sends to the server. Server returns the Factorial of the received integer value to the client.	Remember	CO 5	AIT005.14
9.	Write a program to implement UDP client server application in which client take a file name from the command line and sends to the server. Server returns the content of received file to the client.	Remember	CO 5	AIT005.14
10.	What is the difference between connected and unconnected sockets?	Understand	CO 5	AIT005.15

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