C3-R3: OPERATING SYSTEMS

NOTE:

> 1. Answer question 1 and any FOUR questions from 2 to 7.
> 2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours   **Total Marks: 100**

1.
a) Differentiate between interrupts and exceptions.
b) How can one detect that a message is lost during Inter Process Communication?
c) What is the use of swap space? How can it be created in UNIX?
d) Distinguish between a virus and a worm.
e) Access Matrix is used for user authentication which can be implemented by Access List and Capability List. Briefly explain the two implementations.
f) How can an user access a file located at remote UNIX server?
g) What are the advantages of distributing execution of entire process or a part of it at different sites in a distributed operating system?

(7x4)

2.
a) Which are the possible events that may occur when a process is being executed by CPU?
b) When does a process terminate? Which system call is used to terminate a process? Under what circumstances a parent process terminates a child process?
c) Define Deadlock. Which are the conditions that should hold simultaneously in a system for a deadlock situation?

(4+6+8)

3.
a) Describe the problems with contiguous allocation method for allocating disk space. How does linked allocation method overcome the disadvantages of contiguous allocation method?
b) Explain External Fragmentation. How the compaction can be used to solve the problem of external fragmentation?
c) What is a thrashing? How can the problem of thrashing be prevented?
d) The linux kernel does not allow paging out of kernel memory. Give one advantage and one disadvantage of this design decision.

(4+4+4+6)

4.
a) Distinguish between different divisions of classification as per US Department of Defence Trusted Computer System Evaluation Criteria.
b) A disk drive has 5000 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 FCFS, SSTF, SCAN, LOOK, disk scheduling algorithms?

(6+12)

5.

a) Consider a system with five processes P0 through P4 and three resource types X,Y, Z. Following is the snapshot of system:

	Allocation			Max			Available		
	X	Y	Z	X	Y	Z	X	Y	Z
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

Answer the following questions:
   i)   State the Safety algorithm and Resource-Request algorithm.
   ii)   Is the system in a safe state?

b) What are the disadvantages of First Come First Serve and Shortest Job First scheduling algorithm?

c) Suppose that the following processes arrive for execution at the times indicated. Each process will run the listed amount of time. Assume non-preemptive scheduling.

Process	Arrival Time	Burst Time
P_1	0.0	8
P_2	0.4	4
P_3	1.0	1

What is the average turnaround time for these processes with the FCFS scheduling algorithm?

d) A CPU scheduling algorithm determines an order for the execution of its scheduled processes. Given n processes to be scheduled one processor, how many possible different schedules are there? Give a formula in terms of n.

(6+4+4+4)

6.

a) 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 LRU page replacement algorithm, assuming three frames?

b) When do page faults occur? Describe the actions taken by the operating system when a page fault occurs

c) Differentiate between logical address and physical address.

(8+6+4)

7.

a) Define a Distributed File System. Explain location transparency and location independence. Consider a user on 'site A' that wants to access data on 'site B'. How the situation is handled by Network Operating System and Distributed Operating System?

b) In a distributed system employing caching mechanism, a client machine is faced with the problem of deciding whether locally cached copy of the data is consistent with master copy. Which two approaches are used to verify the validity of cached data?

c) What are the key design issues that must be dealt with in building a distributed operating system?

(8+8+2)