

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) What are the differences between Windows and Linux OS?
 - b) What resources are used when a thread is created? What additional resources are required when a process is created?
 - c) Explain role of device controllers and device drivers. How does controller interact with the CPU by means of interrupt?
 - d) Define Operating System. Explain various Operating System Services.
 - e) What is the difference between exceptions and interrupts? How does operating system preserves the integrity of the kernel data structure during handling the interrupt?
 - f) Capability lists are usually kept within the address space of the user. How does the system ensure that the user cannot modify the contents of the list? What are the main difference between capability lists and access lists?

(7x4)

2.
 - a) In the context of paging systems, discuss the following:
 - i) Thrashing and causes of thrashing
 - ii) Global versus Local Allocation of Page Frames
 - iii) Working Set Model
 - iv) Pre-paging
 - b) Consider the paging system with the page table stored in memory. What is the effective memory reference time if a memory reference takes 200 nanoseconds? How long does a paged memory reference take if we add associative registers, and 80 percent of all page-table references are found in the associative registers? (Assume that finding a page table entry in the associative registers take 20 nanoseconds, if the entry is there.)
 - c) With the help of a diagram, explain the hardware used for segmentation. How are protection and sharing inherently supported by segmentation scheme?

(8+4+6)

3.
 - a) Consider the following snapshot of system

	Alloc					Max					Avail			
	Processes					Processes (maximum					Available system			
	(currently allocated					resources)					resources			
	A	B	C	D		A	B	C	D		A	B	C	D
P1	1	2	2	1	P1	3	3	2	2		3	1	1	2
P2	1	0	3	3	P2	1	2	3	4					
P3	1	1	1	0	P3	1	1	5	0					

Answer the following questions using the banker's algorithms:

- i) What are the maximum units of all resources?
- ii) What are the contents of the matrix need?
- iii) Is the system in safe state?
- iv) If the process P3 requests 1 unit of resource C, can the request be granted?

- b) What information is available in a Process Control Block (PCB)?
 - c) Distinguish between hard real-time systems and soft real-time systems? What careful design aspects are required in implementing a real time scheduler and related aspects of the OS?
- (10+2+6)**

- 4.**
- a) Suppose that a disk drive is currently serving a request at cylinder 11. The queue of pending requests in FIFO order is 1, 36, 16, 34, 9 and 12. Starting from the current head position, what is the total distance that the disk arm moves to satisfy all the pending requests, for each of the following disk-scheduling algorithms?
 FCFS
 SSTF
 SCAN/Elevator
 - b) How does DMA increase system concurrency?
 - c) Differentiate between Network Operating System and Distributed Operating System.
 - d) Discuss design issues of Distributed Systems.
- (8+2+6+2)**

- 5.**
- a) What are the advantages of a Distributed File System over a file system in a centralized system?
 - b) How is an Access Matrix used for protection?
 - c) Distinguish between Program threats and System/Network threats, giving two examples of each.
- (6+6+6)**

- 6.**
- a) What is a Encryption algorithm? Explain Symmetric Encryption and Asymmetric Encryption.
 - b) What are the three requirements that must be satisfied by the solution to the critical section problem?
 - c) Distinguish between batch system, time sharing systems and real-time systems.
- (6+6+6)**

- 7.**
- a) Comment on the internal and external fragmentation caused in a file system using i) Contiguous allocation, ii) Linked allocation, iii) Indexed allocation.
 - b) What are the main advantages of the layered approach and microkernel approach to operating system design?
 - c) Five processes arrive at time given, in the order, with the length of the CPU-burst time given in milliseconds
- | Process | Arrival Time | Burst Time |
|---------|--------------|------------|
| P1 | 0.0 | 7 |
| P2 | 2.0 | 4 |
| P3 | 4.0 | 1 |
| P4 | 5.0 | 4 |
- Consider the FCFS, SJF (Non Preemptive) and SJF (Preemptive) scheduling algorithms for this set of processes. Which algorithm gives the least average waiting time?
- (9+3+6)**