C0-R4.B2: OPERATING SYSTEM

NOTE:

1. **Answer question 1 and any FOUR from questions 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) Give minimum five differences between Multiprogramming and time sharing operating systems.
b) What are the necessary conditions to hold a deadlock in a system?
c) Distinguish between client-server and peer-to-peer models of distributed systems.
d) What do you mean by cloning? How is it achieved in Linux systems?
e) State the causes of thrashing and discuss its solution.
f) List essential requirements of critical section implementation.
g) Give two reasons why caches are useful. What problems do they solve?

(7x4)

2.

a) Describe the differences between symmetric and asymmetric multiprocessing. Give three advantages and one disadvantage of multiprocessor systems.
b) What are the two models of inter-process communication? Write some reasons for providing an environment that allows process cooperation.
c) Describe the actions taken by a kernel to context-switch between processes.
d) Explain the difference between internal and external fragmentation.

(5+5+4+4)

3.

a) Write the differences among short-term, medium-term, and long-term scheduling.
b) Consider a logical address space of 64 pages of 1,024 words each, mapped onto a physical memory of 32 frames.
   - How many bits are there in the logical address?
   - How many bits are there in the physical address?
c) A paging scheme uses a Translation Look-aside Buffer (TLB). A TLB-access takes 10 ns and a main memory access takes 50 ns. What is the effective access time(in ns) if the TLB hit ratio is 90% and there is no page-fault?
d) Write short notes on following:
   - Page size are always kept to the power of 2.
   - Belady'sAnomly

(4+5+4+5)

4.

a) Briefly explain the **shortest-remaining-time-first** scheduling. Consider the following table, Draw Gantt chart and find out average waiting time using SJF scheduling algorithm.

Process	Arrival Time (ms)	Burst Time (ms)
P1	0	8
P2	1	4
P3	2	9
P4	3	5

b) Write the definition of a Process? Explain the Process Control Block and the various process states.
c) Write short note on RAID and its levels. Also explain the Striping and Mirroring.
d) On a disk with 1000 cylinders' numbers 0 to 999. Compute the number of tracks and disk arms must move to satisfy all the request in the disk queue. Assume the latest request received was

at track 345 and the head is moving towards track 0. The queue in FIFO order contains request for the following tracks. 123,874,692,475,105,376. Perform the computation for the following scheduling algorithms. i)FIFO ii)SSTF iii)SCAN

(4+4+4+6)

5.

a) Show that, if the wait () and signal () semaphore operations are not executed atomically, then mutual exclusion may be violated.

b) What is encryption? Why do we need encryption? Briefly mention the various techniques of encryption.

c) Is it possible to secure the system protocols? Explain and justify your answer.

d) Consider the following snapshot of a system:

Process	Allocation				Max				Available			
	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

Answer the following questions using the banker's algorithm:

i) What is the content of the matrix **Need**?

ii) Is the system in a safe state?

iii) If a request from process *P*1 arrives for (0,4,2,0), can the request be granted immediately?

(4+4+4+6)

6.

a) 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.

b) Give the difference between preemptive and non-preemptive scheduling. Why strict non-preemptive scheduling is unlikely to be used in a computer center?

c) Write a solution to the Sleeping Barber Problem using locks and condition variables. Your solution must prevent philosopher starvation.

(6+6+6)

7.

a) Consider the virtual page reference string

1, 2, 3, 2, 4, 1, 3, 2, 4, 1

On a demand paged virtual memory system running on a computer system that main memory size of 3 pages frames which are initially empty.How many page fault occur for the following replacement algorithm, assuming three frames

1) FIFO 2) OPTIMAL 3) LRU

b) Consider a system with 80% hit ratio, 50 nano-seconds time to search the associative registers, 750 nano-seconds time to access memory.

Find the time to access a page:

i) When the page number is in associative memory.

ii) When the time to access a page when not in associative memory.

iii) Find the effective memory access time.

(9+9)