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) What basic services are provided by an Operating system?
b) List three examples of deadlocks that may be observed in real life and are not related to a computer system environment.
c) Why are page sizes always powers of 2?
d) What is the difference between a virus and a worm? How do they each reproduce?
e) Differentiate between Preemptive and Non-Preemptive CPU scheduling. Name how CPU scheduling algorithms for each type of scheduling.
f) What is the purpose of Memory Management Module of an Operating System? Write down three function values of memory management module of an operating system.
g) Define Cache Memory. How does Cache Memory improve memory access time for CPU?

(7x4)

2.

a) Distinguish between the client–server and peer-to-peer models of distributed system.
b) Write down the name of structure used by Operating System to maintain information about a process. Also write down any four information related to specific process which are maintained in this structure.
c) What are main differences between user-level threads and kernel-level threads?

(6+6+6)

3.

a) Suppose that a scheduling algorithm favors those processes that have used the least processor time in the recent past. Why will this algorithm favor I/O bound program and yet not permanently starve CPU bound program?
b) A barbershop consists of a waiting room with *n* chairs, and the barber room containing the barber chair. If there are no customers to be served, the barber goes to sleep. If a customer enters the barbershop and all chairs are occupied, then the customer leaves the shop. If the barber is busy, but chairs are available, then the customer sits in one of the free chairs. If the barber is asleep, the customer wakes up the barber. Write a program to coordinate the barber and the customers.

(6+12)

4.

a) Given memory partitions of 100 KB, 500 KB, 200 KB, 300 KB and 600 KB (in order), how would each of the first-fit, best-fit and worst-fit algorithms place processes of size 212 KB, 417 KB, 112 KB and 426 KB (in that order) ? Which algorithm makes the most efficient use of memory?
b) Consider a virtual address space of eight pages with 1024 bytes each, mapped onto a physical memory of 32 frames. How many bits are used in the virtual address? How many bits are used in the physical address?
c) What is the use of file system? Briefly discuss about stateful and stateless file system.

(6+6+6)

5.

a) Consider the following snapshot of a system with 5 processes (P0 to P4) and 4 resources (A to D):

	Allocation	**Max**	**Available**
	A B C D	**A B C D**	**A B C D**
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 P1 arrives for (0, 4, 2, 0), can the request be granted immediately?

b) Under what circumstances do page faults occur? Describe the actions taken by the operating system when a page fault occurs.

c) Why is deadlock detection much more expensive in a distributed environment than in a centralized environment?

(6+6+6)

6.

a) Writ down two advantages in having variant time-quantum sizes at different levels of a multilevel queuing system?

b) Why does Shortest Seek Time First Disk scheduling alongwith favor middle cylinders over the innermost and outermost cylinders? Explain with example.

c) Write a C program using fork() call to generate Fibonacci series through a child process.

(6+6+6)

7.

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 following replacement algorithms, assuming five frames? Remember all frames are initially empty, and hence reference to any page first time will cost one page fault each.

- LRU replacement
- FIFO replacement
- Optimal replacement

b) Disk requests come to the disk driver for accessing cylinders 10, 22, 20, 2, 40, 6, and 38, in given order. The disk head is currently at cylinder 20 and previous request was at cylinder 15. How much seek time is needed for following algorithm, when seek time for positioning the head at a cylinder is 6 msec?

(i) FCFS (ii) SSTF (iii) SCAN

c) How does encryption protect misuse of data from an unauthorized user?

(8+6+4)