B3.4-R4: 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 is CPU Scheduling? Write down the scenario in which a running process may be preemptive?

b) Consider two programmers who are working on a joint project and want to store related files in a directory for easy search. Briefly explain the suitable directory structure.

c) Define race condition. Why is it necessary to avoid race condition?

d) What are advantages and disadvantages of providing mandatory locks instead of advisory locks whose usage is left to user's discretion.

e) Why is virtual memory concept used? Explain by giving one example.

f) What is file system? Name one file system each for windows and Linux Operating System.

g) Define network operating system?. Write down its two main functionalities over a stand-alone system.

(7x4)

2.

a) What is multiprocessors scheduling? Why is it complicated to implement than single CPU scheduling?

b) Consider the following set of processes:

Process	Burst time(ms)	Arrival time(ms)
P1	5	0
P2	3	2
P3	4	4
P4	1	5
P5	2	7

i) Draw Gantt Chart illustrating the execution of the given processes using Round robin policy (time slice = 2ms) and shortest remaining time scheduling algorithms.

ii) Compute turnaround and total waiting time for each process for both algorithms and find the algorithm with best performance w.r.t. average waiting time.

(6+12)

3.

a) Consider the following types of operating system:

i) Soft real time
ii) Hard real time
iii) Time Sharing System

Which of the above given Operating System would you prefer in the following application environment and Why?

i) Multi-media application
ii) Online Railway ticket reservation system
iii) Missile control application

b) What is operating system? Why is it necessary to have atleast two modes of operation i.e. user mode and kernel mode in a computer system? Explain briefly.

(9+9)

4.

a) Distinguish between the following terms:
   i) Logical and physical address
   ii) Multiprogramming and multitasking

b) What is thrashing? When does it occur in system? How does an operating system eliminate thrashing in the system?

(12+6)

5.

a) Consider a logical address space of 8 pages with 1024 words per page, mapped onto a physical memory of 16 frames.
   i) How many bits are there in the logical address?
   ii) How many bits are there in the physical address?

b) Define external fragmentation. Which type of contiguous memory allocation techniques suffer from external fragmentation? Explain by giving one example.

c) List the steps for handling page fault in implementing virtual memory through demand paging. Draw figure for the same.

(6+6+6)

6.

a) What is consistency semantics? Write down UNIX consistency semantics. How UNIX consistency semantics is different from Immutable shared files semantics?

b) What information is contained in on-disk structure to implement a file system?

c) Suppose that a disk has 1,000 cylinders numbered 0 to 999. The disk head is currently at cylinder 943 and previous request was at 125. The queue of pending requests in FIFO order is:
   470, 913, 77, 948, 509, 130, 500
   Calculate and show total head movements for the following disk scheduling algorithms:
   i) FCFS
   ii) SCAN

(6+6+6)

7.

a) Why are system threats more dangerous to system security than program threats? Briefly explain about denial of service threat.

b) "In distributed environment, ensuring atomicity of a transaction is difficult". Comment. Which module of the distributed operating system ensures atomicity of a transaction? Write down its basic responsibilities.

c) Given two sets Process set (P) and Resources set (R)
   $P = \{P_1, P_2, P_3, P_4\}$
   $R = (R_1, R_2\}$
   Two instances of resource type R_1 and R_2 each exist in the system.
   $E = \{ P_1 \rightarrow R_1, R_1 \rightarrow P_2, R_1 \rightarrow P_3, R_2 \rightarrow P_1, P_3 \rightarrow R_2, R_2 \rightarrow P_4\}$
   Using the process requests for resources and allocated resources to the processes given in set E, draw a resource allocation graph and describe whether the system can go into a deadlock state or not?

(6+6+6)