**B3.4-R4: OPERATING SYSTEMS**

**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) Relate the terms "Abstraction" and "Arbitration" with Operating system.

b) What is a process? What are the various attributes of a process?

c) The file system buffer cache does both buffering and caching. Describe why buffering is needed?

d) What are the basic criteria for the performance matrix in distributed system (Mutual Exclusion Algorithm)? Explain any one of them in brief.

e) Compare I/O based on polling with interrupt-driven I/O. In what situation any one technique is preferable over the other?

f) Differentiate secret-key and public-key cryptography.

g) Enumerate the advantages and disadvantages of supporting multi-threaded applications with kernel-level threads**.**

**(7x4)**

**2.**

a) Suppose a disk has 200 cylinders, numbered 0 to 199. The disk head starts at number 100. The queue of pending requests, in first in first out order is:

23, 89, 132, 42, 187

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 the given following algorithms?

i) FCFS
ii) SCAN
iii) LOOK
iv) C-SCAN

b) What is race condition? How does a critical section avoid this condition? What are the properties that a data item should possess to implement a critical section?

**(9+9)**

**3.**

a) What is the purpose of Election algorithm in distributed system? Explain Bully algorithm

b) Explain the protection domain in UNIX.

c) Give the differences between batch and time sharing operating systems.

**(6+6+6)**

**4.**

a) Consider the following set of processes, with the length of the CPU burst time given in milliseconds. The processes are assumed to have arrived in the order P1, P2, P3, P4, P5 at time 0. Calculate average waiting time and turn-around time using given scheduling algorithm. Draw Gantt Chart for Scheduling algorithms:

i) SJF
ii) Non-preemptive priority (a smaller priority number implies a higher priority)
iii) RR (quantum= 1)

| Process | Burst Time | Priority |
|---|---|---|
| P1 | 10 | 3 |
| P2 | 1 | 1 |
| P3 | 2 | 3 |
| P4 | 1 | 4 |
| P5 | 5 | 2 |

b) Consider the following snapshot of a system:

| | Allocation | | | | Max | | | | Total Instances | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | A | B | C | D | A | B | C | D |
| **P** | 1 | 0 | 2 | 0 | 3 | 2 | 5 | 2 | 13 | 13 | 9 | 13 |
| **Q** | 0 | 3 | 1 | 2 | 4 | 5 | 1 | 2 | | | | |
| **R** | 2 | 4 | 5 | 1 | 10 | 7 | 7 | 5 | | | | |
| **S** | 3 | 0 | 0 | 6 | 5 | 7 | 0 | 8 | | | | |
| **T** | 4 | 2 | 1 | 3 | 6 | 2 | 1 | 4 | | | | |

Using Banker's algorithm,

i) Determine whether the system is in a safe state or not.

ii) Decide whether a request from process Q for resources A B C D(3, 1, 0, 0) should be granted immediately or not.

**(9+9)**

**5.**

a) Describe the necessary conditions for Deadlock.

b) What are the flaws in following page replacement policies?

i) FIFO

ii) LRU

iii) NFU

c) What is thrashing and when does thrashing occur?

**(8+6+4)**

**6.**

a) Assuming three states of a process (Running, Ready, Blocked), draw and explain the state transition diagram.

b) Compare NTFS and FAT32 file systems.

c) State three advantages of placing functionality in a device controller, rather than in the kernel. State three disadvantage.

**(8+6+4)**

**7.**

a) What is an Operating System? What are the functions of the operating system?

b) Discuss the swapping in brief? How does buddy system speed up merging when process swaps out?

c) What are the advantages of a Distributed File System over a file system in a centralized system?

**(6+6+6)**