

### 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) Explain Process Control Block in detail.
  - b) Consider a logical address space of 8 pages of 1024 Bytes mapped into memory of 32 frames.
    - i) How many bits are there in the logical address?
    - ii) How many bits are there in physical address?
  - c) Consider the following segment table:

Segment	Base	Length
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

What are the physical addresses for the following logical addresses?

- i) 0,430
  - ii) 1,10
  - iii) 4,11
  - iv) 2,500
- d) From a security point of view, which four goals the computer systems have, with corresponding threats to them?
- e) What is deadlock? What are the conditions for resource dealocks?
- f) File systems are stored on the disk. Explain file system layout stored on the disk.
- g) Explain the concept of Virtual Private Network (VPN).

**(7×4)**

2.
  - a) With reference to FIFO page replacement algorithm, explain Belady's anomaly for available page frames 3 and 4 using suitable example.
  - b) Consider 'Assigned' and 'Request matrix' for a set of processes.

	Assigned				Request		
	R1	R2	R3		R1	R2	R3
P1	2	1	0	P1	1	2	0
P2	0	1	1	P2	1	5	3
P3	3	1	0	P3	4	3	3
P4	1	0	1	P4	3	0	0
P5	1	1	0	P5	0	1	2

**Total Resources  
(8 5 4)**

With the help of Banker's algorithm, check whether the system is in safe state or not. Show the steps in detail.

- c) Differentiate: FAT16 vs NTFS file system.

**(6+6+6)**

3.

- a) A disk has 1000 cylinders, numbered 0 to 999. The drive is currently serving a request at cylinder 135, and the queue of pending requests is:

**89, 470, 913, 775, 948, 509, 33, 11, 134, 230**

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 Elevator and C-Look disk-scheduling algorithms? Previous request was at cylinder 100. Draw the head movement diagrams for each scheduling algorithm.

- b) Briefly discuss the differences between Partitions, Volumes and Multi-Partition.  
c) In Producer-Consumer problem, two processes share a common, fixed-size buffer. The problem with that approach is that a wakeup sent to a process is lost. Semaphores solve the lost-wakeup problem. How that problem can be solved with the help of semaphore?

**(6+6+6)**

4.

- a) Consider the following set of processes in order P1, P2, P3, P4 and P5 with the length of the CPU burst time given in milliseconds. Calculate average waiting time and turn-around time using Shortest Job First (Pre-emptive) and Round Robin (quantum=3ms) scheduling algorithm. Draw Gantt chart for both the algorithms.

Process	Arrival Time	Burst Time
P1	0	9
P2	1	7
P3	2	6
P4	3	7
P5	4	3

- b) An operating system protection mechanism can be viewed as an access matrix. How can the access matrix be implemented effectively?  
c) Explain the concept of Symmetric and Asymmetric Multiprocessing.

**(6+4+8)**

5.

- a) Consider a swapping system in which memory consists of the following hole sizes (free memory) in memory order: 10 KB, 4 KB, 20 KB, 18 KB, 7 KB, 9 KB, 12 KB and 15 KB. Which hole is taken for successive segment requests of (i) 12 KB, (ii) 10 KB (iii) 9 KB for First Fit, Next Fit, Best Fit and Worst Fit?

- b) Explain the two methods used to manage Directory in file system.  
c) In distributed system, files are replicated in different machines. Explain the file replication concept in distributed system.

**(8+5+5)**

6.

- a) What are the major functionalities of a Network operating system?  
b) Discuss the three important aspects of tertiary-storage.  
c) What do you mean by authentication in operating system? How is the authentication mechanism implemented in Linux operating system?

**(6+6+6)**

7.

- a) Consider the following page reference string:

**5, 7, 2, 1, 3, 4, 7, 2, 1, 3, 2, 1, 4, 5, 7**

How many page faults would occur for least-recently-used and FIFO page replacement algorithms, assuming 5 frames? Initially pages 7, 5 and 1 are loaded in the main memory.

- b) Discuss the design issues of distributed operating system?

**(8+10)**