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) What is blocking I/O?

b) Why bit-vector is an inefficient way of free space management?

c) Linked allocation of physical disk block is not good. Why?

d) What is thrashing? How it can be reduced?

e) What is TLB? How is it used?

f) Name the four necessary conditions for deadlock.

g) Name four disk scheduling algorithms.

(7x4)

2.

a) Explain clearly how circular wait can be broken. What is wait-for graph?

b) Given the following data, check whether there is a deadlock.

Available = $(2\ \ 0\ \ 0\ \ 1)$; Request= $\begin{pmatrix} 2 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 2 & 1 & 0 & 0 \end{pmatrix}$; Allocation= $\begin{pmatrix} 0 & 0 & 1 & 0 \\ 2 & 1 & 0 & 1 \\ 0 & 0 & 2 & 0 \end{pmatrix}$

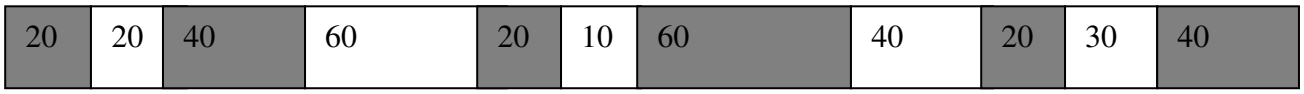
(9+9)

3.

a) Define Logical address and Physical address.

b) Draw the state diagram to map a logical address to a physical address using limit register and relocation register?

c) A dynamic partitioning scheme is being used, and the following is the memory map at a given point in time.



The shaded areas are allocated blocks; white areas are free blocks. The block sizes are in MB. The next three memory requests are for 40M, 20M, and 10M. Indicate the starting address for each of the three blocks using the following placement policies. (i) First Fit (ii) Best Fit (iii) Worst Fit

(4+5+9)

4.

a) Consider the following table showing different jobs with their arrival time, priority, time of execution etc. Let the system do the scheduling in the following way. Initially the system starts with a round-robin scheduling with a time quantum of 1 unit. After half of the number of jobs is completed, the system starts using non-preemptive priority based scheduling. Assume lower priority value means higher priority. Calculate the following parameters in such a scheduling.

i) Average waiting time

ii) Average turnaround time

Job	Time	Arrival	Priority
1	13	0	3
2	9	1	2
3	10	2	1
4	5	3	4

b) Using semaphore, solve the producer-consumer synchronization problem with two buffers. Try to maximize concurrency.

(9+9)

5.

a) What is File Control Block? Where is it stored?

b) In UNIX, the block size is 4KB, and each block can hold a total of 512 block addresses. Also an inode contains 15 addresses out of which first 12 are direct, and the remaining three are single indirect, double indirect, and triple indirect. What can be the maximum file size in such a case?

c) Calculate how much disk space (in sectors, tracks, and surfaces) will be required to store 90000 number of logical records (each 200-byte) if the disk is fixed-sector with 512 bytes/sector, 128 sectors per track, 130 tracks per surface, and 12 usable surfaces per disk. Ignore any other records, and assume that a record cannot span two sectors.

(6+6+6)

6. Consider the following sequence of virtual addresses from a 460-byte program.

10, 11, 104, 170, 73, 309, 185, 245, 246, 434, 458, 364

a) Give the reference string assuming page size of 100 byte.

b) Find the number of page faults for LRU, FIFO, OPT (assume that initially frames are empty and in such case there is no page fault).You have to show what pages are in memory in each time. Assume that there are 200 bytes of physical memory.

(6+[3x4])

7. Suppose the following table is there.

Process	P1	P2	P3	P4	P5
Arrival time	0	2	3	5	9
Service time	3	3	2	5	3

Calculate the mean turn-around time of FCFS, Shortest request next, and highest response ratio next (scheduling schemes) for the above table. Explain these algorithms also?

(6+6+6)