Time: 3 Hours **Marks: 80**

1. Question 1 is compulsory.
2. Attempt any **three** from remaining five questions.
3. Assume suitable data where required.

1 a. Discuss Operating System as a Resource Manager. [5]

b. Draw process state diagram and explain the following states: [5]

1. New [5]
2. Ready
3. Running
4. Wait
5. Suspended ready
6. Suspended wait

c. Describe Microkernel with a diagram.

d. Discuss the importance of "Multithreading". Differentiate between kernel and user thread.

2 a. Differentiate between short term, medium term and long term scheduler with a diagram. [10]

b. Calculate AWT, ATAT, Response Time and Throughput of the following processes using Shortest job first (Non Pre-emptive). [10]

Process	Arrival Time (ms)	Burst Time (ms)
P1	1	7
P2	2	5
P3	3	1
P4	4	2
P5	5	8

3 a. What are Semaphores? Differentiate between Counting and Binary Semaphores. Discuss Dinning Philosopher problem. [10]

b. What do you understand by a deadlock? Explain deadlock avoidance method. [10]

4 a. Explain different types of memory fragmentation. [8]

b. Compare the performance of FIFO, LRU and Optimal based on number of page hit for the following string. Frame size = 3; String (pages): 1 2 3 4 5 2 1 3 3 2 4 5 [12]

5 a. Explain Interrupt driven IO and discuss the advantages of Interrupt driven IO over programmed IO. [10]

b. Discuss various disk scheduling methods. [10]

6. a. Discuss various File Allocation Mechanism and their advantages. [10]

b. Explain Unix iNode Structure in detail. [10]

Duration: 3hours **Marks: 80**

NB: (1) Question no. 1 is compulsory.
(2) Attempt any three out of remaining five questions.
(3) Assume data if required

Q-1 Attempt any FOUR

a Define Operating System. Brief the Functions of OS. 5

b Explain Shell. Explain use of chmod command in linux. 5

c Discuss various scheduling criteria. 5

d Explain the effect of page frame size on performance of page replacement algorithms. 5

e Explain Thrashing. 5

2-a Differentiate between monolithic, layered and microkernel structure of OS. 10

b Describe the differences among short term, medium-term, and long term Scheduling 10

3-a Discuss how the following pairs of scheduling criteria conflict in certain settings. 10
a) CPU utilization and response time
b) Average Turnaround time and maximum waiting time

b Consider the following snapshot of the system. Using Bankers Algorithm, determine whether or not system is in safe state. If yes determine the safe sequence.

	Allocation				**Max**				**Available**			
	A	**B**	**C**	**D**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**
P0	3	0	1	4	5	1	1	7	0	3	0	1
P1	2	2	1	0	3	2	1	1				
P2	3	1	2	1	3	3	2	1				
P3	0	5	1	0	4	6	1	2				
P4	4	2	1	2	6	3	2	5				

4-a Calculate number of page faults and page hits for the page replacement policies FIFO, Optimal and LRU for given reference string 6, 0, 5, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 5, 2, 0, 5, 6, 0, 5 (assuming three frame size). 10

b Explain synchronization problem in detail. How counting semaphore can be used to solve readers writers problem. 10

5-a Given memory partitions of 150k,500k,200k,300k,550k(in order) how would each of the first fit, best fit and worst fit algorithm places the processes of 220k,430k,110k,425k(in order).Evaluate, which algorithm makes most efficient use of memory? 10

b Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests in FIFO is ordered as 80, 1470, 913, 1777, 948, 1022, 1750,130. What is the total distance that the disk arm moves for following by applying following algorithms? 10
1. FCFS 2. SSTF 3. LOOK 4. SCAN

Q-6 Write short notes on: (any two): 20
(a) Linux Virtual File system
(b) Process State transition
(c) System Calls

Q. P. Code: 38498

Duration: 3hours **Marks: 80**

NB: (1) Question no. 1 is compulsory.
(2) Attempt any three out of remaining five questions.
(3) Assume data if required

Q-1 Attempt **any FOUR**

a Explain the difference between monolithic kernel and micro kernel. 5
b What is mutual exclusion? Explain its significance. 5
c Discuss various scheduling criteria. 5
d Explain various file allocation techniques 5
e Explain the disk cache. 5

2-a What is operating system? Explain various functions and objectives. 10
b What is deadlock? Explain the necessary and sufficient condition for deadlock. What is the difference between deadlock avoidance and prevention? 10

3-a Explain the following in brief: 10
(a) Process synchronization (b)Inter-Process Communication
b Consider the following set of processes, assuming all are arriving at time 0. 10

process	Burst time	Priority
P1	2	2
P2	1	1
P3	8	4
P4	4	5
P5	5	3

Calculate average waiting time and turn-around time for FCFS, SJF (Non-Pre-emptive), Priority and RR (Quantum=2).

4-a What is paging? Explain LRU, FIFO and Optimal page replacement policy for the following string. Page frame size is 4. 10
1,2,3,4,5,3,4,1,6,7,8,7,8,9,7,8,9,5,4,5,4,2
b Explain banker's algorithms in detail. 10

5-a What is system call? Explain any five system call in details. 10
b Explain paging hardware with TLB along with protection bits in page table. 10

Q-6 Write short notes on: **(any two):** 20
(a) Linux Virtual file system
(b) Process control block
(c) Readers and writer problem using Semaphore
(d) Explain disk scheduling algorithms.

****

Duration: 3hours **Marks: 80**

NB: (1) Question no. 1 is compulsory.
(2) Attempt any three out of remaining five questions.
(3) Assume data if required

Q-1 Attempt any FOUR

a Explain the difference between monolithic kernel and micro kernel. **5**

b What is mutual exclusion? Explain its significance. **5**

c Discuss various types of scheduler. **5**

d Explain various process states with diagram. **5**

e What is the effect of page size on performance of operating systems? **5**

2-a What is operating system? Explain various functions and objectives. **10**

b What is deadlock? Explain the necessary and sufficient condition for deadlock. **10**

3-a Explain counting semaphore with examples. **10**

b Consider the processes P1, P2, P3, P4 given in the below table, arrives for execution in the same order, with Arrival Time 0, and given Burst Time. Draw the Gantt chart and find the average waiting time using the FCFS and SJF (Non-Pre-emptive) scheduling algorithm. **10**

process	Burst time
P0	21
P1	3
P2	6
P3	2

4-a What is paging? Explain LRU, FIFO and Optimal page replacement policy for the following string. Page frame size is 4. Calculate the hit ratio for the same. **10**
1,2,3,4,5,3,4,1,6,7,8,7,8,9,7,8,9,5,4,5,4,2

b Explain data structures used in banker's algorithms with example. **10**

5-a What is system call? Explain any five system call in details. **10**

b Explain virtual memory concept with respect to paging, segmentation and TLB. **10**

Q-6 Write short notes on: (any two): **20**
(a) Linux Virtual file system
(b) Resource Allocation graph
(c) Readers and writer problem using Semaphore
(d) Compare disk scheduling algorithms.
