DESIGN OF OPERATING SYSTEM

1)

a) Describe the objective of multiprogramming. How time sharing systems differ from multiprogrammed batched systems.
b) Differentiate between monolithic and modular kernel structure.
c) Explain the interrupt driven 1/0 with its two limitations.

2)

a) Differentiate between medium term and long term scheduler.
b) Compare the direct indirect addressing scheme with respect to the message passing scheme.
c) What are the advantages of using multithreading instead of multiple processes?

3)

a) Differentiate between user level and kernel level thread.
b) Explain the different states of a process with a state diagram.
c) Explain the race condition with an example.

4)

a) Consider the following set of processes with the length of the CPU burst given in milliseconds.

Process	Arrival time	Burst time	Priority
P1	0	4	3
P2	0	2	1
P3	1	3	2
P4	2	2	4

Draw the Gantt charts that illustrate the execution of these processes using the preemptive priority scheduling and find the number of context switching occurs here.

b) Draw the Gantt charts that illustrate the execution of the processes specified in 4(a) using HRRN scheduling and find the average turnaround time of the processes.
c) Write a semaphore solution to a bounded buffer producer consumer problem.

5)

a) How does a monitor support synchronization?
b) What are the necessary conditions for a deadlock?
c) Consider a system with 12 tapedrives and 3 processes: PO, P1,P2. PO requires 4 tape drives, P1 requires 10 tapedrives, P2 requires 9 tapedrives for completing their task. Suppose at time to, PO is holding 2 tapedrives, P1 is holding 5 tapedrives and P2 is holding 2 tape drives. Then check whether the current resource allocation state is safe or not. If yes, specify the safe sequence.

6)

a) What are the protocols used to prevent deadlock by avoiding no preemption condition?

	Allocation				Request			
	A	B	C	D	A	B	C	D
P0	0	1	1	0	0	0	1	0
P1	0	1	0	1	1	0	0	1
P2	1	2	0	0	0	0	0	1
P3	0	0	1	2	0	0	0	0
P4	1	0	1	0	0	1	0	0

Consider the above resource allocation state with 4 processes and 4 resources, and an available vector of <0100>. Check whether the system with the above resource allocation state is deadlock free or not.

b) In the resource allocation state specified in 6(b), if P0 is assigned with 1 more instance of type B, then check whether the system is deadlock free or not.

7)

a) Define internal fragmentation. Find the internal fragmentation for a process with size 83412 bytes in a paging scheme with a 2KB page size.
b) Given four memory partitions of 200k, 600k, 400k, 700k (in order). How the first fit and best-fit algorithm would place processes of 312k, 517k, 212k, 526k (in order) in those partitions.
c) Explain the address translation scheme of paging technique with a paging hardware.

8)

a) Consider a byte addressable system with physical address space of 128 byte, Logical address space of 64 byte and a page size of 16 byte. If the page table entry is 3, 7, 8, 2, then what will be the physical address of logical address 31?
b) Differentiate between equal and proportional frame allocation techniques with examples.
c) What is the page fault? Discuss the steps taken by the operating system to handle page fault.

9)

a) Consider a main memory with three page frames and the following sequence of page references: 4, 7, 6, 1, 7, 6, 1, 2, 7, 2. Assuming all the page frames are initially empty. Find the total number of page faults that will occur using the FIFO page replacement policy.
b) Find the total number of page faults that will occur for the reference string specified in 9(a) using the LRU page replacement policy.
c) Consider a disk with 200 tracks numbered from 0 to 199. At a given time, it was servicing the request of reading data from track 120 and at the previous request, service was for track 90. The pending requests (in order of their arrival) are for track numbers:

30, 70, 115, 130, 110, 80, 20, 25

Find the number of times the head changes its direction for the disk scheduling policies FCFS and SSTF.

10)

a) Trace the following program segment and determine how many processes are created. Draw a graph that shows how the processes are related.

```
int main() {
   pid_t c1-1,c2=1;
   c1 = fork();
   if (c1 != 0)
      c2 = fork();
   if (c2 = 0)
      fork();
   printf(" 1");
   return 0;
}
```

b) What will be the dynamic priority of a process having static priority 130 and average sleep time 750 ms in linux OS?

c) For what minimum average sleep time value a process with static priority 108 can be considered as an interactive process by the scheduler in the linux system?