Operating Systems

Assignment Questions

NOTE:

- *Use A4 size papers with proper left hand side margin.*
- *This is a dynamic file, and questions will be updated as they are covered in the class.*
- *Keep doing the assignments given. You may have to submit the file for evaluation on demand.*

1. Write your view points in justification of the statement "***Operating Systems is core of a computer system and is also known as a resource manager***".
2. Write and explain key functions performed by the kernel and the shell of the OS.
3. How does system call work?
4. Explain key characteristics of following types of operating systems.

   Bath processing, Multiprogramming, Multitasking, Realtime, Multiprocessor (Symmetric and Asymmetric multiprocessing), Parallel processing and Distributed Operating Systems.
5. Analyze and compare Monolithic and Micro Kernel.
6. Describe Hard and Soft Booting of an OS. Also, explore and analyze the Linux booting process.
7. Define Process, Process Control Block (PCB), and context switching.
8. Describe a State transition diagram of a process.
9. An operating system uses the Shortest Remaining Time first (SRTF) process scheduling algorithm. Consider the arrival times and execution times for the following processes:

Process	Execution time	Arrival time
P1	20	0
P2	25	15
P3	10	30

P4	15	45

What is the total waiting time for process P2?

(A) 5 (B) 15 (C) 40 (D) 55

10. Consider a system in which a process requires 40-time units of burst time. The Multilevel feedback queue scheduling is used and time quantum is 2 units for the top queue and is incremented by 5 units at each level, then in what queue the process will terminate the execution?

11. Consider the following set of processes with their CPU-burst times and arrival times mentioned here:

Process	**Arrival Time**	**Burst Time (ms)**
P1	0	17
P2	12	25
P3	28	8
P4	36	32
P5	46	18

Consider a multilevel feedback queue scheduling with three queues, numbered as Q1,Q2, and Q3. The scheduler first executes processes in Q1, which is given a time quantum of 8 ms. If a process does not finish within this time, it is moved to the tail of the Q2. The scheduler executes processes in Q2 only when Q1 is empty. The queue Q2 is given a time quantum of 16 ms. if a process does not finish within this time, it is moved to the tail of the Q3. processes in Q3 are run on an FCFS basis, only when Q1 and Q2 are empty. Processes in Q1 and Q2 are scheduled using the Round robin algorithm (quantum 2 sec).

A process that arrives in Q1 will preempt a process in Q2 and Q3, and a process that arrives in Q2 will preempt a process in Q3. ***Draw and describe a Gantt chart to show the multilevel feedback queue scheduling for the processes P1 to P5.***

12. Consider the following set of processes, and schedule them using the Multi-level feedback queue CPU scheduling algorithm as used in **UNIX SVR3**.

Process	**CPU Burst**	**Arrival time**	**Base Priority**

P1	2	0	60
P2	1	1	60
P3	3	2	60

13. Consider the following set of processes, and schedule them using FCFS CPU Scheduling Algorithm.

Process	**Arrival Time**	**(Burst Time, IO Burst Time, Burst Time)**
P1	0	(3, 2, 1) Total CB= 4
P2	0	(1, 3, 1) Total CB= 2
P3	3	(1, 1, 2) Total CB= 3
P4	6	(2, 4, 3) Total CB= 5

14. Consider a variant of the RR scheduling algorithm in which the entries in the ready queue are pointers to the PCBs. What would be the effect of putting two pointers to the same process in the ready queue? Explain with a proper diagram.

15. What do you mean by Co-Operating Process? How they are different from Independent Process.

16. Explain Producer-Consumer problem of process synchronization. Also give a solution to synchronize Producer and Consumer by using Semaphore.

17. Explain Bakery Algorithm. Describe how this algorithm is satisfying the necessary conditions.

18. What resources are used when a thread is created? How do they differ from those when a process is created?

19. What is a deadlock? List the Coffman's conditions (*Necessary and Sufficient Conditions*) that lead to a deadlock.

20. Consider 5 processes *P*0 through *P*4; 3 resource types *A* (10 instances), *B* (5instances, and *C* (7 instances). Snapshot at time *T*0:

	Allocation	***Max***	***Available***
	A B C	*A B C*	*A B C*
*P*0	0 1 0	7 5 3	3 3 2
*P*1	2 0 0	3 2 2	

*P*2	3 0 2	9 0 2
*P*3	2 1 1	2 2 2
*P*4	0 0 2	4 3 3

Answer the following questions using the banker's algorithm:

a. What is the content of the matrix *Need*?

b. Is the system in a safe state?

c. If a request from process *P*1 arrives for (0,4,2), can the request be granted immediately?

21. Consider the following segment table:

Segment	**Base**	**Limit**
0	231	114
1	717	201
2	232	69
3	619	532

What are the physical addresses for the following logical addresses?

(a) 0, 59 (b) 0, 261 (c) 1, 391 (d) 3, 222 (e) 3, 911

22. Define virtual memory. Consider a reference string: 4, 7, 6, 1, 7, 6, 1, 2, 7, 2. The number of frames in the memory is 3. Find out the number of page faults respective to LRU Page Replacement Algorithm.

23. Explain the layered architecture of the File System. Is it possible for a computer system to have more than one file system? Explain.

24. Define rotational latency, and seek time with respect to disk I/O. Consider a disk queue with requests for I/O to blocks on cylinders 98, 183, 41, 122, 14, 124, 65, 67. The FCFS scheduling algorithm is used. The head is initially at cylinder number 53. The cylinders are numbered from 0 to 199. Calculate the total head movement (in number of cylinders) incurred while servicing these requests.

25. In the Context of Operating Systems, define protection and security.