Attempt ALL Questions:

Q1) Mark each statement with T or F on the Bubble Sheet: [10 Marks]

1. Operating systems have a common device driver for all device controllers.
2. Multiprocessor systems have two or more processors in close communication, sharing the computer bus with separate clock, memory, and peripheral devices.
3. The hardware allows privileged instructions to be executed only in user mode.
4. The operating system implements the abstract concept of a file by managing mass storage media and the devices that control them.
5. Main memory is the only large storage area that the processor can access directly.
6. After synchronous I/O starts, control returns to user program without waiting for I/O completion.
7. Program execution and resource allocation are example of operating-system services provides functions that are helpful to the user.
8. Some system programs are simply user interfaces to system calls; others are considerably more complex.
9. The fundamental idea behind a virtual machine is to abstract the hardware of different computers into a single execution environment.
10. The objective of multiprogramming is to have some process running at all times, to minimize CPU utilization.
11. The long-term scheduler may need to be invoked only when a process leaves the system.
12. It is important that the CPU scheduler select CPU-bound processes more than I/O-bound processes.
13. If any two processes want to communicate with each other, a communication link must exist between them.
14. A major problem with FCFS scheduling algorithms is starvation.
15. SJF is the optimal scheduling technique because it gives the minimum average waiting time for any given set of processes.
16. Concurrent access to shared data may result in data inconsistency.

17. Semaphore is a synchronization tool that requires busy waiting.
18. MMU is a hardware device that at run time maps physical address to logical address.
19. Most computers allow the page table to be very large; therefore, the page table is kept in main memory.
20. With FIFO page replacement, adding more frames can cause more page faults.

Q2) Select an appropriate choice for each of the following sentences on the Bubble Sheet: [20 Marks]

21. What is the main function of the command interpreter?
    a. to get and execute the next user-specified command
    b. to provide the interface between the API and application program
    c. to handle the files in operating system
    d. none of the mentioned
22. The systems which allow only one process execution at a time, are called _____
    a. uniprogramming systems
    b. uniprocessing systems
    c. unitasking systems
    d. none of the mentioned
23. In Unix, which system call creates the new process?
    a. new
    b. create
    c. fork
    d. none of the mentioned
24. What is the ready state of a process?
    a. when process is scheduled to run after some execution
    b. when process is unable to run until some tasks has been completed
    c. when process is using the CPU
    d. none of the mentioned
25. A process stack does not contain _____
    a. Function parameters
    b. Local variables
    c. Return addresses
    d. PID of child process
26. What is a Process Control Block?
    a. Process type variable
    b. Data Structure
    c. A secondary storage section
    d. A Block in memory
27. What is the degree of multiprogramming?
    a. the number of processes executed per unit time
    b. the number of processes in the ready queue
    c. the number of processes in the I/O queue
    d. the number of processes in memory
28. What is the objective of multiprogramming?
    a. Have some process running at all times
    b. Have multiple programs waiting in a queue ready to run
    c. To minimize CPU utilization
    d. None of the mentioned
29. If all processes CPU bound, the ready queue will almost always be _____ and the short term Scheduler will have a _____ to do.
    a. full, little
    b. full, lot
    c. empty, little
    d. empty, lot
30. Which of the following need not necessarily be saved on a context switch between processes?
    a. Contents of registers
    b. Translation lookaside buffer
    c. Program counter
    d. All of the mentioned
31. If a process is executing in its critical section, then no other processes can be executing in their critical section. This condition is called _____

c. synchronous exclusion
d. asynchronous exclusion

a. mutual exclusion
b. critical exclusion

32. Process synchronization can be done on _____
a. hardware level
b. software level
c. both hardware and software level
d. none of the mentioned

33. Which of the following two operations are provided by the IPC facility?
a. write & delete message
b. delete & receive message
c. send & delete message
d. receive & send message

34. Which of the following are TRUE for direct communication?
a. A communication link can be associated with any number of processes
b. A communication link can be associated with exactly two processes
c. Multiple communication links exist between each pair of processes
d. Exactly two communication links exist between each pair of processes

35. . The Zero Capacity queue _____
a. is referred to as a message system with buffering
b. is referred to as a message system without buffering
c. is referred to as a link
d. none of the mentioned

36. Remote Procedure Calls are used _____
a. for communication between two processes remotely different from each other on the same system
b. for communication between two processes on the same system
c. for communication between two processes on separate systems
d. none of the mentioned

37. What is the full form of RMI?
a. Remote Memory Installation
b. Remote Memory Invocation
c. Remote Method Installation
d. Remote Method Invocation

38. . The initial program that is run when the computer is powered up is called _____
a. boot program
b. bootloader
c. initializer
d. bootstrap program

39. What is a trap/exception?
a. hardware generated interrupt caused by an error
b. software generated interrupt caused by an error
c. user generated interrupt caused by an error
d. none of the mentioned

40. DMA is used for _____
a. High speed devices
b. Low speed devices
c. Utilizing CPU cycles
d. All of the mentioned

41. In the layered approach of Operating Systems _____
a. Bottom Layer(0) is the User interface
b. Highest Layer(N) is the User interface
c. Bottom Layer(N) is the hardware
d. Highest Layer(N) is the hardware

42. An I/O bound program will typically have _____
a. a few very short CPU bursts
b. many very short I/O bursts
c. many very short CPU bursts
d. a few very short I/O bursts

43. In the following cases preemptive scheduling occurs?
a. When a process switches from the running state to the ready state
b. When a process goes from the running state to the waiting state
c. When a process switches from the waiting state to the ready state
d. All of the mentioned

44. The switching of the CPU from one process or thread to another is called _____
    a. process switch
    b. task switch
    c. context switch
    d. all of the mentioned
45. What is Response time?
    a. the total time taken from the submission time till the completion time
    b. the total time taken from submission time till first response is produced
    c. the total time taken from submission time till the response is output
    d. none of the mentioned
46. With round robin scheduling algorithm in a time shared system _____
    a. using very large time slices converts it into First come First served scheduling algorithm
    b. using very small time slices converts it into First come First served scheduling algorithm
    c. using extremely small time slices increases performance
    d. using very small time slices converts it into Shortest Job First algorithm
47. The strategy of making processes that are logically runnable to be temporarily suspended is called _____
    a. Non preemptive scheduling
    b. Preemptive scheduling
    c. Shortest job first
    d. First come First served
48. An SJF algorithm is simply a priority algorithm where the priority is _____
    a. the predicted next CPU burst
    b. the inverse of the predicted next CPU burst
    c. the current CPU burst
    d. anything the user wants
49. A solution to the problem of indefinite blockage of low – priority processes is _____
    a. Starvation
    b. Wait queue
    c. Ready queue
    d. Aging
50. Which of the following scheduling algorithms gives minimum average waiting time?
    a. FCFS
    b. SJF
    c. Round – robin
    d. Priority
51. What is the advantage of dynamic loading?
    a. A used routine is used multiple times
    b. An unused routine is never loaded
    c. CPU utilization increases
    d. All of the mentioned
52. The major part of swap time is _____ time.
    a. waiting
    b. execution
    c. transfer
    d. none of the mentioned
53. Which one of the following is the address generated by CPU?
    a. physical address
    b. absolute address
    c. logical address
    d. none of the mentioned
54. The relocation register helps in _____
    a. providing more address space to processes
    b. a different address space to processes
    c. to protect the address spaces of processes
    d. none of the mentioned
55. External fragmentation will not occur when?
    a. first fit is used
    b. best fit is used

c. worst fit is used
d. no matter which algorithm is used, it will always occur

56. Every address generated by the CPU is divided into two parts. They are _____
a. frame bit & page number
b. page number & page offset
c. page offset & frame bit
d. frame offset & page offset

57. With paging there is no _____ fragmentation.
a. internal
b. external
c. either type of
d. none of the mentioned

58. If a page number is not found in the TLB, then it is known as a _____
a. Buffer miss
b. TLB miss
c. TLB hit
d. All of the mentioned

59. The segment limit contains the _____
a. starting logical address of the process
b. starting physical address of the segment in memory
c. segment length
d. none of the mentioned

60. . A process is thrashing if _____
a. it is spending more time paging than executing
b. it is spending less time paging than executing
c. page fault occurs
d. swapping can not take place

Q3) Select an appropriate result for each of the following problems on the Bubble Sheet: [15 Marks]

- All processes share a semaphore variable mutex, initialized to 1. Each process must execute wait(mutex) before entering the critical section and signal(mutex) afterward.

61. Suppose a process executes in the following manner:

```
signal(mutex);
.....
critical section
.....
wait(mutex);
```

In this situation:
a. a deadlock will occur
b. processes will starve to enter critical section
c. several processes maybe executing in their critical section
d. all of the mentioned

62. Suppose a process executes in the following manner:

```
wait(mutex);
.....
critical section
.....
wait(mutex);
```

In this situation:
a. a deadlock will occur
b. processes will starve to enter critical section
c. several processes maybe executing in their critical section
d. all of the mentioned

Consider the following set of processes, the arrival time and the length of the CPU burst time given in milliseconds:

Process	Arrival time	Burst time
P1	0	6
P2	2	8
P3	5	7
P4	7	3

Assume the processes are scheduled with the RR (time quantum: 2) scheduling algorithm.

63. The waiting time for process P1 is _____
a. 9 MS b. 13 MS c. 15 MS d. 21 MS

64. The turnaround time for process P2 is _____
a. 13 MS b. 15 MS c. 21 MS d. 23 MS

65. The waiting time for process P4 is _____
a. 2 MS b. 3 MS c. 5 MS d. 12 MS

66. The average turnaround time is _____
a. 7 MS b. 9 MS c. 15 MS d. 25 MS

Consider a logical address space of eight pages of 2 KB each, mapped onto a physical memory of 64 frames.

67. How many bits are there in the logical address?
a. 4 bits b. 7 bits c. 14 bits d. 17 bits

68. How many bits are there in the physical address?
a. 4 bits b. 7 bits c. 14 bits d. 17 bits

Given memory partitions of 100K, 500K, 300K, and 600K (in order).

69. With best-fit algorithm, a process with size 228K will put in the partition _____
a. 100K b. 300K c. 500K d. 600K

70. With worst-fit algorithm, a process with size 112K will put in the partition _____
a. 100K b. 300K c. 500K d. 600K

71. With first-fit algorithm, a process with size 112K will put in the partition _____
a. 100K b. 300K c. 500K d. 600K

A process refers to 5 pages, in the order: A, B, C, D, A, B, E, A, B, C, D, E.

72. If the page replacement algorithm is FIFO, the number of page faults with an empty internal store of 3 frames is _____
a. 6 b. 7 c. 9 d. 10

73. If the page replacement algorithm is LRU, the number of page replacements with an empty internal store of 3 frames is _____
a. 6 b. 7 c. 9 d. 10

74. If the optimal page replacement algorithm is used, the number of page faults with an empty internal store of 3 frames is _____
a. 6 b. 7 c. 9 d. 10

75. If the page replacement algorithm is FIFO, the number of page replacements with an empty internal store of 4 frames is _____
a. 6 b. 7 c. 9 d. 10

Q4) Why is it that, on a system with paging, a process cannot access memory it does not own? Why it is easier to share a reentrant module using segmentation than it is to do so when paging is used? Why it is easier to apply virtual memory using paging than it is to do so when segmentation is used? [6 Marks]

Q5) Memory structures for paging can get huge using straight-forward methods. Explain alternative methods for structuring page tables. [9 Marks]