
QUESTION 1 MULTIPLE CHOICE QUESTIONS:
[15 MCQs of 15 Marks]

1. The occurrence of an event in O.S is usually signaled by _____ from either the software or hardware.
 - a. Process
 - b. Thread
 - c. **Interrupt**
 - d. RAM
2. In _____, one processor acts as a master or boss and allocates the jobs to the worker processors.
 - a. multicore systems
 - b. **asymmetric multiprocessing**
 - c. symmetric multiprocessing
 - d. fault tolerant processors
3. To defend the system against external and internal attacks. It is the task of:
 - a. **security**
 - b. protection
 - c. encryption
 - d. authentication
4. Which of the mobile operating systems is an open source software
 - a. Windows
 - b. **Android**
 - c. Apple iOS
 - d. All above
5. _____ provide(s) an interface to the services provided by an operating system.
 - a. Shared memory
 - b. **System calls**
 - c. Simulators
 - d. Communication
6. Which is used for communication in a client-server system?
 - a. Sockets
 - b. Pipes
 - c. Remote Procedure Call
 - d. **All of the above**

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7. Which of memory parts include global variables
 - a. **Data section**
 - b. Stack
 - c. Heap
 - d. Text section

 8. It distributing threads across cores, each thread performing unique operation. That is referred to as:
 - a. **Task parallelism**
 - b. Thread library
 - c. Java Thread
 - d. Thread local storage

 9. Many user-level threads mapped into a single kernel thread
 - a. **Many-to-One**
 - b. One-to-One
 - c. Many-to-Many
 - d. Multiprocessor

 10. The measure of CPU work is the number of processes that are completed per unit time and it is called:
 - a. **Throughput**
 - b. Turnaround Time
 - c. CPU job
 - d. None.

 11. CPU Scheduling deals with the problem of deciding which process in the ready queue is to be allocated to _____.
 - a. **CPU**
 - b. Dispatcher
 - c. Interrupt handler
 - d. None

 12. When several processes access the same data concurrently and the outcome of the execution depends on the particular order in which the access takes place.
 - a. dynamic condition
 - b. **race condition**
 - c. essential condition
 - d. critical section
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13. Which one of the following is a synchronization tool?
- a. Thread
 - b. Pipe
 - c. Semaphore
 - d. Socket
14. Process synchronization can be done on
- a. Hardware level
 - b. Software level
 - c. Both (a) and (b)
 - d. None of the mentioned
15. What is the correct order of operations for protecting a critical section using mutex locks?
- a. acquire() then release()
 - b. release() then acquire()
 - c. wait() then signal()
 - d. signal() then wait()

Question 2: TRUE OR FALSE QUESTIONS

[10 MARKS]

1	Device controller is a software in the operating system that manages I/O using different ports	F
2	The kernel is the program running in the system all the time	T
3	iOS is a mobile operating system designed for the iPhone and iPad.	T
4	A process consists of only one thread	F
5	A process is a stored program	F
6	An independent process can be affected by another process.	F
7	Each user-level thread is not maps into a kernel thread in one to one Multithreading Models.	F
8	Semaphore can solve various synchronization problems.	T
9	wait() followed by signal() is the correct order of operations for protecting a critical section using mutex locks.	F
10	Concurrent access to shared data may result in data inconsistency.	T

Question 3:

[7 marks]

1. Given the following set of processes and the length of the CPU burst given in milliseconds:

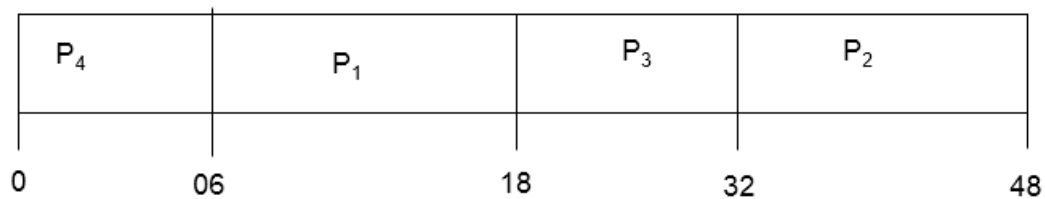
Process	Burst Time
P1	12
P2	16
P3	14
P4	6

- a. Show how these processes are scheduled according to **Shortest Job First Scheduling**. Use the following chart. Inside each box, write the name of the process [P1, ...,P4], and specify the start and end of each scheduled time in the blanks below. Note the start time of the first process is 0 ms, and is shown.

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Answer:

- a. SJF scheduling chart



[3 Marks]

Waiting time:

Process	Waiting Time
P1	06
P2	32
P3	18
P4	08

b. *Average waiting time* = $(6 + 32 + 18 + 0) / 4 = 14$. [2 Marks]

c. Which process has the longest waiting time? P2 [2 Marks]

Question 4:

[5 marks]

What are the states of a process? Give brief description.

- new - the process is created
- running - the process is being executed
- waiting - the process is waiting for an I/O
- ready - the process is ready to be executed
- terminated - the process completed execution

Question 5:

[3 marks]

Give Three examples of recourse type:

CPU cycles, memory space, I/O devices

Question 6:

[5 marks]

Distinguish between internal and external fragmentation.

Fragmentation occurs when memory is allocated and returned to the system. As this occurs, free memory is broken up into small chunks, often too small to be useful. External fragmentation occurs when there is sufficient total free memory to satisfy a memory request, yet the memory is not contiguous, so it cannot be assigned. Some contiguous allocation schemes may assign a process more memory than it actually requested (i.e. they may assign memory in fixed-block sizes). Internal fragmentation occurs when a process is assigned more memory than it has requested and the wasted memory fragment is internal to a process.

Question 7:

[5 marks]

Describe the dining-philosophers problem and how it relates to operating systems.

Answer: The scenario involves five philosophers sitting at a round table with a bowl of food and five chopsticks. Each chopstick sits between two adjacent philosophers. The philosophers are allowed to think and eat. Since two chopsticks are required for each philosopher to eat, and only five chopsticks exist at the table, no two adjacent philosophers may be eating at the same time. A scheduling problem arises as to who gets to eat at what time. This problem is similar to the problem of scheduling processes that require a limited number of resources.