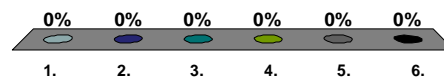


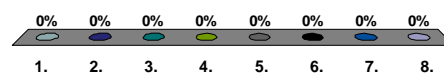
How many ECUs (Electronic Control Units)  
are in the average modern car?

1. 1 to 5
2. 5 to 10
3. 10 to 20
4. 20 to 40
5. 40 to 80
6. 80 to 160



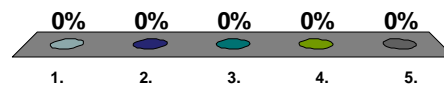
What are the stimuli of the Engine  
Control Unit?

1. Air temperature
2. Engine temperature
3. Pedal pressure
4. Fuel grade
5. Tire pressure
6. All of the above
7. 1 to 4
8. 1 to 3



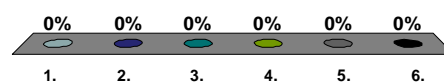
## Which is most important for adaptive suspension?

1. comfort
2. performance
3. both
4. neither
5. it depends



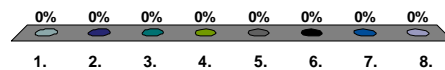
## What are the two main types of garbage collection in a real-time system?

1. Utility-based and stochastic-based
2. Utility-based and time-based
3. Utility-based and work-based
4. Time-based and work-based
5. Time-based and stochastic-based
6. Stochastic-based and work-based



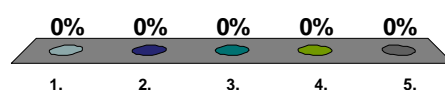
When using semi-space garbage collection, if we will need 1 MB to store our data, how much memory will we need?

1. 0 MB
2. 0.5 MB
3. 1 MB
4. 1.5 MB
5. 2 MB
6. 2.5 MB
7. 3 MB
8. 5 MB



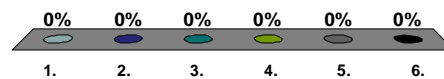
Which category does semi-space garbage collection fall into?

1. Time-based
2. Work-based
3. Both
4. Neither
5. It depends



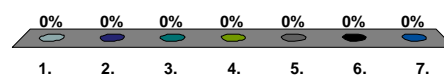
## Why is real-time detection of concussions important?

1. Avoiding lawsuits
2. Protecting young athletes
3. Protecting professional athletes
4. Detecting weak brains
5. All of the above
6. 1 to 3



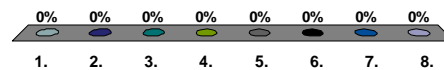
## Where do the stimuli to U of Arkansas' concussion detection system come from?

1. Gyroscopes
2. Accelerometers
3. Electrical sensors
4. GPS
5. All of the above
6. 1 to 3
7. 1 and 2



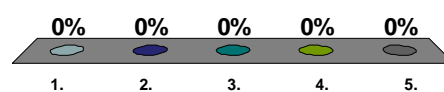
## What are the properties of a firm real-time system?

1. Missed deadlines are catastrophic
2. Missed deadlines are not catastrophic
3. Data is available when deadlines are missed
4. Data is not available when deadlines are missed
5. 1 and 3
6. 2 and 4
7. 2 and 3
8. 1 and 4



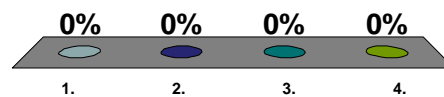
## What is an RTOS?

1. Real-time operating system
2. Real-time open source
3. Real-time outer space
4. Re-tweet On Steroids
5. Regression Testing of Source



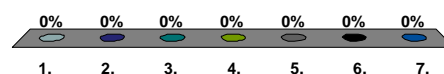
What well known O/S is the UAV  
(Unmanned Aerial Vehicle) RTOS based  
on?

1. Windows
2. Unix
3. Solaris
4. Linux



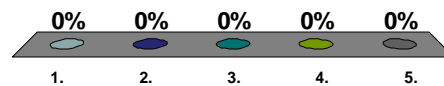
Why are Amazon drones not yet in  
use?

1. Awaiting FAA regulations
2. Still in testing phase
3. Privacy concerns
4. They will be shot down by your neighbour
5. All of the above
6. 1 to 3
7. 1 and 2



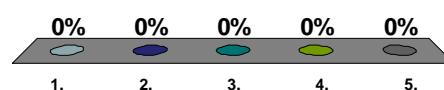
Which is the best example of a hard real-time system?

1. Cell phone
2. Telephone switch
3. 911
4. ABS braking system
5. Coke machine



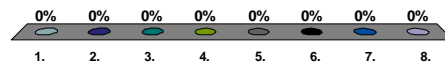
Which is the best example of a soft real-time system?

1. Cruise control
2. Plane auto-pilot
3. ATM machine
4. Heart pace-maker
5. Solitaire game



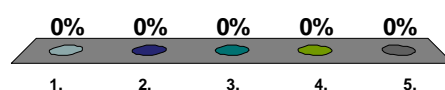
## What is the middle layer of our 5 layer protocol stack?

1. Network interface
2. Internet
3. UDP
4. TCP
5. Application
6. Transport
7. Network hardware
8. TFTP



## What layer does TCP implement?

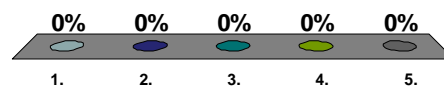
1. Network interface
2. Internet
3. Application
4. Transport
5. Network hardware





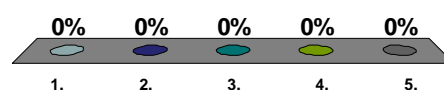
## What layer does UDP implement?

1. Network interface
2. Internet
3. Application
4. Transport
5. Network hardware



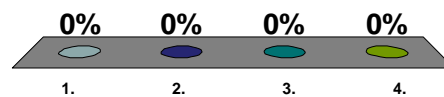
## What layer does TFTP implement?

1. Network interface
2. Internet
3. Application
4. Transport
5. Network hardware



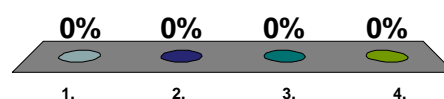
## What is the purpose of mutual exclusion?

1. To ensure that threads execute only when the program state is appropriate
2. To ensure that only one thread runs at a time
3. To protect critical sections
4. To force all threads to run simultaneously



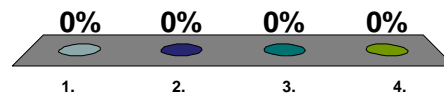
## What is the purpose of condition synchronization?

1. To ensure that threads execute only when the program state is appropriate
2. To ensure that only one thread runs at a time
3. To protect critical sections
4. To force all threads to run simultaneously

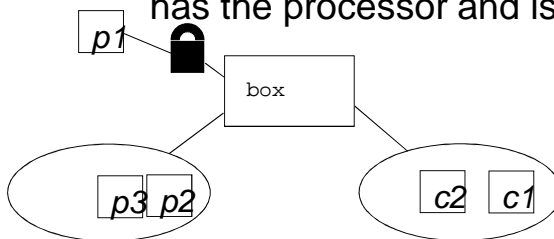


What does it mean if we have a class with 3 methods, all of which are synchronized?

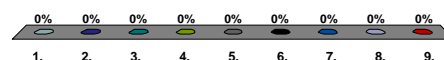
1. At most 3 threads can access the class at the same time
2. At most 3 threads can access each instance of the class at the same time
3. At most one thread can access the class at once
4. At most one thread can access each instance of the class at once



Assuming a uni-processor, what thread currently has the processor and is executing?

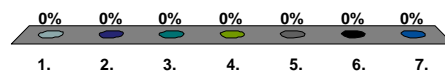


1. P1
2. P2
3. P3
4. C1
5. C2
6. Another thread not pictured
7. C1 or c2
8. P2 or p3
9. P1 or another thread not pictured



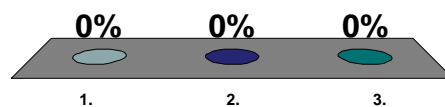
In TFTP, what is the minimum number of file bytes per DATA block?

1. 511
2. 512
3. 1
4. 0
5. 1024
6. 1025
7. 1023



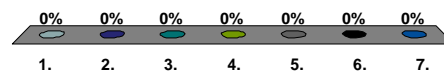
Can we use notify() instead of notifyAll() in our Box class?

1. yes
2. no
3. sometimes



What is a good example of a Conditionally Thread-Safe class?

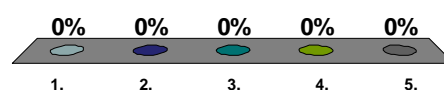
1. Box
2. Thread.stop()
3. ArrayList
4. Integer
5. A synchronized collection
6. Int
7. Object



What is wrong with this code segment?

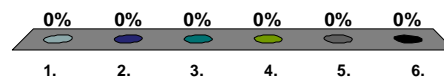
```
synchronized(a) {
    while(...) {
        try { wait(); } catch(InterruptedException e) {return;}
    }
    a.someMethod(...);
    ...
}
```

1. "a" should be box or buffer
2. someMethod must be synchronized
3. We should notifyAll() not wait()
4. It should be a.wait() not wait()
5. "a" must be a Thread



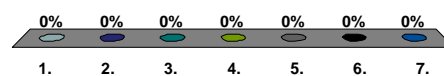
## What are the 3 ways of stopping a thread that we discussed in the lectures?

1. `thread.stop()`, `thread.suspend()`, `thread.resume()`
2. `thread.stop()`, `thread.stopRequested()`, `thread.interrupt()`
3. `thread.stop()`, `thread.wait()`, `thread.notifyAll()`
4. `thread.stop()`, `thread.wait()`, `thread.sleep()`
5. `thread.stop()`, `thread.kill()`, `thread.die()`
6. `thread.stop()`, `thread.interrupt()`, `thread.wait()`



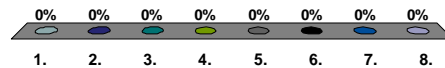
## In TFTP, what do we do when we receive duplicate DATA packet n?

1. write to file, send ACK n
2. write to file, send ACK n+1
3. write to file and do not respond
4. discard, send ACK n
5. discard, send ACK n+1
6. discard and don't respond
7. the JVM can choose



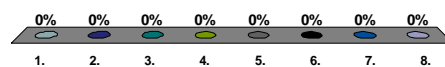
What do we do when we receive duplicate ACK packet n?

1. Timeout and retransmit DATA n+1
2. Timeout and retransmit DATA n
3. Timeout and retransmit DATA n-1
4. Ignore and do not respond
5. Ignore and send DATA n
6. Ignore and send DATA n+1
7. Ignore and send DATA n-1
8. the JVM can choose



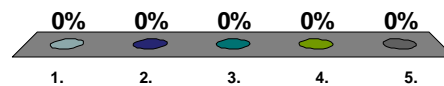
What is/are the advantage(s) of green threads?

1. the JVM has complete control over its threads
2. it's less work than having the O/S deal with the threads
3. we can have as many Java thread priorities as we like
4. your Java threads will behave exactly the same regardless of O/S
5. it's up to the JVM
6. all of the above
7. 2 and 3
8. 1 and 4



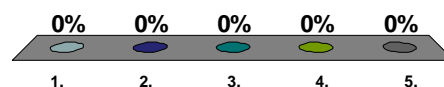
How do we know if a group of processes can be scheduled using a cyclic executive?

1. If we draw a minor/major cycle timeline and they fit
2. If they pass the Liu-Layland equation
3. If they fail the Liu-Layland equation, but we draw a timeline and they all meet their first deadline
4. All of the above
5. 2 and 3



How do we know if a group of processes can be scheduled using a cyclic executive?

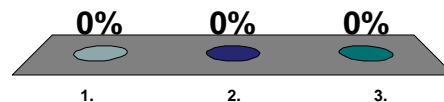
1. If we draw a minor/major cycle timeline and they fit
2. If they pass the Liu-Layland equation
3. If they fail the Liu-Layland equation, but we draw a timeline and they all meet their first deadline
4. All of the above
5. 2 and 3





The Liu-Layland equation gives 78% as the bound for 3 processes. If the total utilization of our 3 processes is 78% then, using rate monotonic priority assignment:

1. They are schedulable
2. They are not schedulable
3. They may be schedulable



Assume our code takes 16ms to run on a uniprocessor and we get a new computer with 4 processors. If we're able to parallelize 25% of our code, what's the minimum time our code will take to run based on the speedup given by

Amdahl's equation:

$$\text{max speedup} = 1/(S + (1-S)/N),$$

where S = fraction of code that is serial  
and N is number of processors

1. 16ms
2. 256/13 ms ( = 19.7ms)
3. 13ms
4. 7ms
5. It depends

