1. No. if the access is read for both threads, then concurrency error will not occur.

2. `b)`, `c)` and `d)` are true

Correct solution

`c)` and `d)` are true

Notes

Question What does it mean when mutex is held by this thread?

Question What I do know is that `pthread_cond_wait` puts thread to sleep. My question here is, how come the mutex is not held when thread is in a blocked state/sleep?

3. a) Only `b)` causes starvation.

   b) Conditional variable is a queue that allows threads to be put themselves on to sleep (in blocked state) when thread it is not desired using `pthread_cond_wait` function.

   Since there are no threads inside `cv1`, there is nothing to awake using `pthread_cond_signal`.

   So, nothing will occur.

   c) System call is a subset of interrupt caused by user application to switch from user mode to kernel mode to perform previleged operations for the application.

   Interrupt is a signal sent by hardware (e.g keyboard, mouse, hard drive) or software.

   It tells the cpu to stop its activities and execute appropriate part of the operating system.

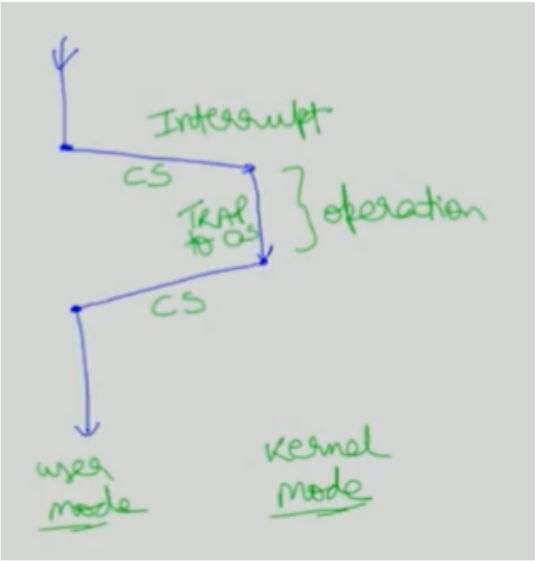
   Notes

   - I need to review how interrupt works. I had to look up the information.

   Question How does interrupt work?

   - **Interrupt**
     - Is a signal
     - there are two types of interrupts:
       - Hardware interrupt
         - Is signal generated by hardware (e.g RAM is full, Hard drive is full)
         - Is sent to operating system
       - Software interrupt
         - Is signal generated by software (e.g program crash, system call)

- Is sent to operating system
- May call trap instruction (esp. system call)



References

1. venkatesan ramachandran, What is an Interrupt?, link

d) No. This statment is false.

User level threads are generated in user-mode without kenerel being aware about it.

Notes

Question What is the difference between user-level thread and kernel-level thread?

Question Why is thread that is generated at user level using procedure call faster than kernel level thread?

Question What is procedure call? How does it work?

- **Procedure call**
  - works in user-mode only
  - doesn't require context switching
  - doesn't need help from OS/Kernel
  - no context-switching → faster

References

1. Tech Dose, System call vs Procedure call, link

e) System calls do not generate processes. `fork()` does.

With this reason the program `run_stuff` generates only 1 additional process.

Notes

Question What is a process? And how does process work?

Question How come system call doesn't generate process? And how come fork() generates process?

- **Process**
  - Is a running program
  - Has 3 states
    1. **Running:**
       - means a processs is running on a processor
       - means instructions are being executed
    2. **Ready:**
       - means a process is ready to run
       - means OS has chosen not to run the program at the given moment
    3. **Blocked:**
       - means a process has performed some kind of operation that makes it not ready to run until some event takes place

4.
```c
typedef struct acct {
    float balance;
    pthread_mutex_t lock;
} account;

void transfer_amount(account *a1, account *a2, float amount) {

    // lock critical section during the transfer process
    // transfer amount

    // lock the transferring user if the balance is negative

}
```

Notes

Question When do we use the while loop like lock?

Question Does the use of if statement to put thread into sleep acceptable?