**Multithreading**

**1. Necessity of multithreading and terms**

*Mono/Multi core CPU and memory model, clock cycles.*

*Thread Schedulers allocation of threads or programs to the CPU.*

*Scheduling Algorithms and priority.*

*Task,Thread,Program and Process.*

**2. Terminology and how things work**

**Ways how CPU execute Tasks***: Concurrency,Parallelism and Concurrency+Parallelism.*

**Programming Models***: Synchronous and Asynchronous.*

**Environments***: Single Threaded and MultiThreading.*

*Dependent and Independent Tasks examples.*

**3. Thread life cycle and thread, task creation in java**

***Thread LifeCycle****: New, Runnable, Running and Terminated.*

*Ways to create task and thread in java.*

*Thread class properties and methods.*

*Know About fork, join and Thread pool and group.*

**4. Problem with multithreading with examples in java**

Race Condition and critical section (dirty read/write problem).

DeadLock (long wait or starvation problem).

Visibility Problem (shared variable value is not updated).

**5. Synchronization — lock/monitor concept for race condition + other approaches**

*Locking concept and different types of locks.*

*Locking (classLevel(static) and objectLevel (instance)).*

*ObjectLevel(applicable to all synchronized methods/blocks in class).*

*ObjectLevel (set lock for every synchronized block/method).*

*Reentrant locks*

*Atomic class and Concurrent Collections (ThreadSafe) , semaphores etc*

**7. Thread local and thread signaling concept**

**8. DeadLock Prevention ways and Volatile Keyword for visibility problem**

**9. Inter thread communication ways — wait(), notify() and notifyAll**

**10.Threads Creation and execution management — ExecutorFramework**

**11. How to work with sync and async multithreaded programs in spring boot examples ?**