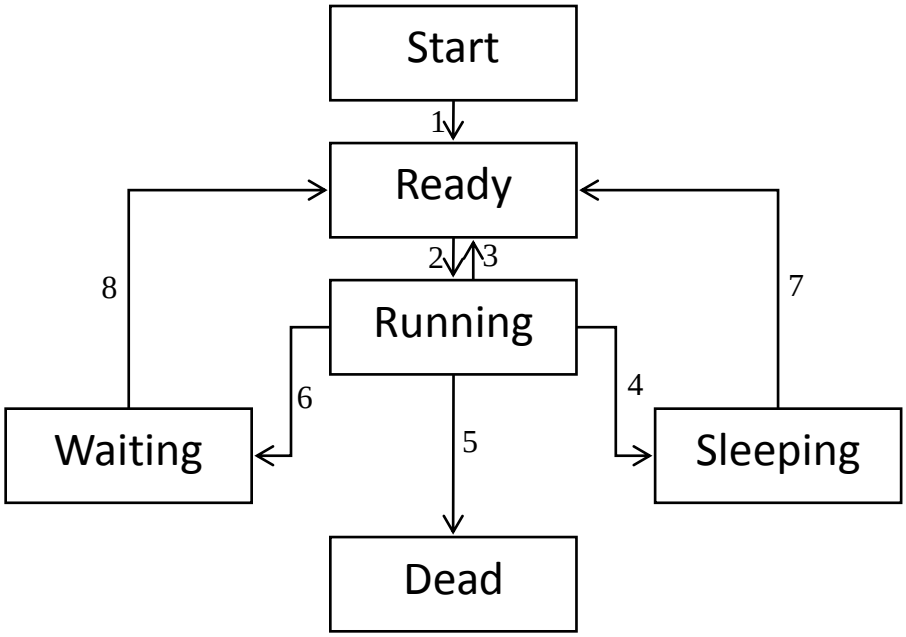
CSCI 201L Final
Spring 2014
13% of course grade

1. **Inheritance -** Explain the difference between an abstract class that only contains abstract methods and an interface. Why would a programmer choose to use an abstract class that only contains abstract methods instead of an interface? **(1.0%)**

2. **Subnetting –** A USC student called his ISP to inquire about getting a set of static IP addresses for his new business. The technician on the line was a UCLA alumnus who told him, "I can give you the following class C address with a subnet mask: 219.135.45.0/22." Does this make sense? If so, what is the range of IP addresses on the network? How many hosts can be on the network? **(2.0%)**

   ```
   219.135.45.0 = 1101 1011  1000 0111  0010 1101  0000 0000
   ```

3. **Multi-threaded Programming –** In the following diagram, explain when a thread moves from one state to another. There are eight transitions to explain. **(1.5%)**



4. **More Multi-Threading –** What are three possible outputs of the following program? What will always be true in the output? **(2.0%):**

```
public class Problem4 {
  public static void main(String[] args ) {
    System.out.println("First line");
    try {
       for (int i=0; i < 10; i++) {
         MyThread t = new MyThread(i);
         t.start();
         t.join();
       }
    } catch (InterruptedException ie) {
      System.out.println("IE: " + ie.getMessage());
    }
    System.out.println("Last line");
  }
}

class MyThread extends Thread {
  private int num;
  public MyThread(int num) {
    this.num = num;
  }
  public void run() {
    for (char c='A'; c <= 'Z'; c++) {
      System.out.print(num + "" + c + " ");
    }
    System.out.println("");
  }
}
```

5. **Monitors and Locks –** Explain the difference between the following two sections of code. Why would a programmer choose to use each? **(2.0%)**

```
// code block #1
class PiggyBank {
  private int balance = 0;
  public int getBalance() {
    return balance;
  }
  public synchronized void deposit(int amount) {
    int newBalance = balance + amount;
    try {
      Thread.sleep(1);
    } catch (InterruptedException ie) {
      System.out.println("IE: " + ie.getMessage());
    }
    balance = newBalance;
  }
}

// code block #2
class PiggyBank {
  private int balance = 0;
  private Lock lock = new ReentrantLock();
  public int getBalance() {
    return balance;
  }
  public void deposit(int amount) {
    lock.lock();
    try {
      int newBalance = balance + amount;
      Thread.sleep(1);
      balance = newBalance;
    } catch (InterruptedException ie) {
      System.out.println("IE: " + ie.getMessage());
    } finally {
      lock.unlock();
    }
  }
}
```

6. **Semaphores –** Given the following code, explain how the following output is generated. What properties will always hold true about the output? **(2.0%)**

```
import java.util.concurrent.Semaphore;

public class Problem6 {
  public static void main(String [] args) {
    for (int i=0; i < 10; i++) {
      SemThread st = new SemThread(i);
      st.start();
    }
  }
}

class SemThread extends Thread {
  private static Semaphore sem = new Semaphore(3);
  private int num;
  public SemThread(int num) {
    this.num = num;
  }
  public void run() {
    try {
      System.out.println(num + ": " + sem.availablePermits());
      sem.acquire();
      Thread.sleep(1000);
    } catch (InterruptedException ie) {
      System.out.println("IE: " + ie.getMessage());
    } finally {
      sem.release();
      System.out.println(num + " done: " + sem.availablePermits());
    }
  }
}
```

```
0: 3
2: 2
5: 1
6: 1
8: 0
9: 0
4: 0
3: 0
7: 0
1: 0
5 done: 3
2 done: 1
0 done: 3
9 done: 2
8 done: 0
6 done: 2
3 done: 1
4 done: 2
1 done: 2
7 done: 3
```

7. **Distributed Computing –** Explain the difference between the functionality of the ExecutorService using a thread pool and the ForkJoinPool. **(1.0%)**

8. **RMI, CORBA, Web Services –** Distributed computing technologies allow a program to execute on another computer though the call occurs locally. We learned that networked code could provide this same functionality. Explain the difference between writing a client-server program to execute some task on the server compared to utilizing one of the distributed computing technologies such as RMI, CORBA, or Web Services. **(1.5%)**