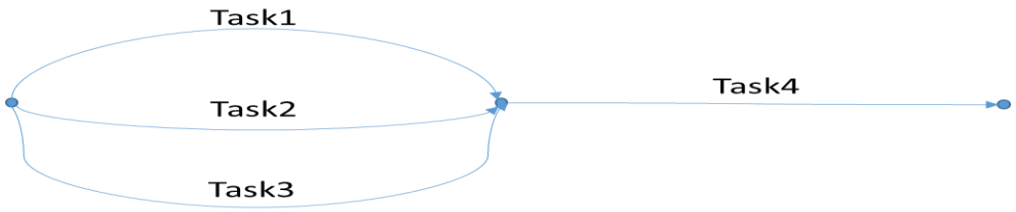
Assignment 7

1. Consider the following workflow (*worth 20 points*).



Task 1 follows a random uniform distribution between 5 and 9; the completion time for Task 2 follows a random exponential distribution with a rate of 0.1; Task 3 follows a Poisson distribution with a lambda of 4; Task 4 follows uniform distribution between 3 and 10. Compute the following.

   a. What are the mean and median times to complete all the tasks?
   b. What is the probability that all the tasks are completed in 15 hours?
   c. Create a plot of the density of the total completion time.

2. Read the file diabetes.csv. There is a variable called **Pregnancies**, which indicates the number of pregnancies. Assuming this follows a poisson distribution, test the hypothesis that the mean number of pregnancies is 3.7 (*worth 20 points*).

3. Read the file diabetes.csv. There is a variable called **Insulin**. Conduct both a parametric and a non-parametric test for the median value of 80. Are the results from both the tests similar? If not, explain why and which test you would trust more (*worth 20 points*).

4. Read the file diabetes.csv. There are two variables called **BMI** and **Outcome**. The variable **Outcome** takes on only two values: 0 and 1. Conduct a non-parametric two sample test for the hypothesis that the standard deviation of **BMI** is the same for both **Outcome** values (*worth 20 points*).

5. Read the file diabetes.csv. There are two variables called **Glucose** and **BloodPressure**. Conduct a non-parametric test for the shapes of the two distributions are identical (*worth 20 points*).

   Hint: We conducted a parametric shape test in the class. As in the example we did in the class, first standardize the two variables and compute a test statistic. To generate the sampling distribution, use the idea of bootstrapping. Pick one of the variables (say Glucose). Create synthetic samples by bootstrapping, compute the statistic, replicate to generate the sampling distribution, and compute the p-value.

(A significant portion of your grade will depend on adequate commenting of the code. Make sure to include your name in the code as a comment).

(Please read: By submitting the assignment, you are confirming that this represents your own work, and that no part of the work submitted has been copied from others. Consequences for cheating can be quite serious. It can lead to not only failing the course but also dismissal from the program)