# Università degli Studi di Torino

(a.a. 2017- 2018)

**Laurea Magistrale**
**INFORMATICA**
Corso di
**Valutazione delle Prestazioni:**
**SIMULAZIONE e MODELLI**
**(Simulation and Modelling)**

**Master of Science**
**STOCHASTIC AND DATA SCIENCE**
Course in
**SIMULATION**

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November 24-th, 2017 **Homework Nr. 8** Due: December 1-st, 2017

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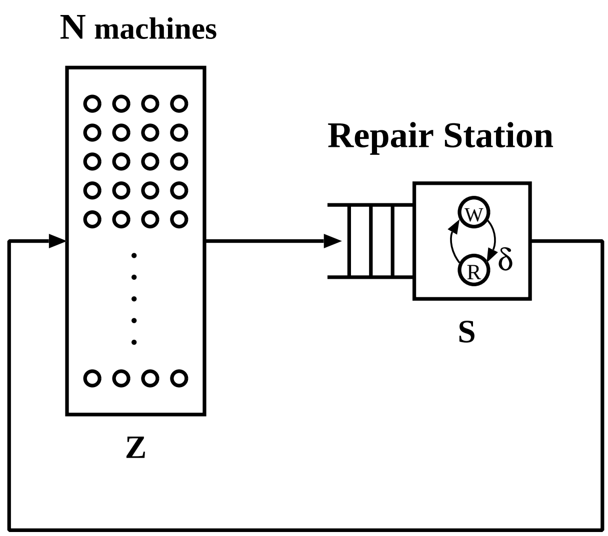
**1) (30 points)** Consider the Machine_Repairman system studied in Homework Nr.7




With the presence of a resting option, suppose we want to study the *Steady State* performance of this system through the interval estimation of the average waiting time at the repair station. Using the same model parameters of the previous homework

- The number of machines in the system is $N = 10$
- Working periods between failures are random variables ($X$) with negative exponential distributions with parameter $Z = E[X] = 300\,min$.
- Repair times are instances of a random variable $Y$ that has a negative exponential distribution with parameter $S = E[Y] = 40\,min$.
- Resting times of the repairman are instances of a random variable $V$ that has a negative exponential distribution with parameter $R = E[V] = 10\,min$.
- The probability of deciding for a resting period of the repairman is $\delta = 0.3$.

compute the interval estimate of the average waiting time using the *Regenerative Method*, stopping the simulation when you have $(1 - \alpha) = 95\%$ confidence in your result and when the width of your confidence interval is globally smaller than 10% of the corresponding point estimate (center of the confidence interval).

To simplify the implementation of your simulator, make sure that when you decide to stop your simulation, the number of regeneration cycles that you are considering for the construction of the sample used as the basis for the computation of the confidence interval is larger than 30 (so that you can use the value of $z_{\alpha/2} = 1.96$ in the final formula). If this is not the case, continue your simulation until you reach this last condition
Notice that, since all the random times considered in this model have negative exponential distributions, the choice of the regeneration point is quite simple.
To improve the quality of your simulation, use different (independent) random number streams for the generation of the instances of the random variables considered in the model (failure time, repair time, resting time, and choice to rest).
To simplify the generation of these instances, use the new version of the random number generator rngs.c that you can download from the Moodle page of this course and that has been published with this homework. To get familiar with the features provided by this new generator, read the comments put by the authors at the beginning of their code. To use the new generator in your program, consider the following suggestions:

- To initialize the random number generator set $seed = 123456789$ and then use the function **PlantSeeds(seed)** instead of **PutSeed(seed)** used before. This will give you the possibility of using 256 different non overlapping streams of random numbers

- To select the stream you want to use to generate the instances of a specific random variable, you must use the function **SelectStream(k)**, where $k$ is the index of the desired stream. Every time you call the function that returns an instance of the random variable of interest, you must make a preliminary call to the **SelectStream** function in order to specify the stream the you want to use.

GOOD LUCK WITH YOUR WORK!