Middle East Technical University
Department of Computer Engineering

CENG 222
STATISTICAL METHODS FOR CENG
Spring 2019
TAKE HOME EXAM 4

Suppose you are wandering with  in some weird universe. There are interesting pickle like creatures popping out from a lake.  asks you to catch every pickle popped out because the needs those for some reason for himself. In an hour number of creatures popped out is a Poisson random variable with $\lambda = 5$.

Now, you started to investigate them in order to understand the evolution behind it. There are two features you will be checking namely (W)eight and (S)peed having the joint pdf:

$$f_{\{W,S\}}(w,s) = wse^{-w-s}, \qquad w > 0, s > 0$$

1) Perform a Monte Carlo study to estimate the probability that the number of creatures you caught in 7 hours having the relationship $W \geq 2S$ is bigger than 8. With probability 0.95, your answer should not differ from the true value by more than 0.005. Use Normal approximation to determine the size of your Monte Carlo simulation.

2) Based on the study in part 1, estimate the total weight of the creatures you caught in 10 hours.

3) Assume that you are investigating new independent features $A \sim exp(2)$ and $B \sim N(0,1)$. Compute the Monte Carlo estimate of $\mathrm{E}[\frac{2A+3B}{3+2|B|}]$.

Submit your Matlab source code and a short report that describes the Monte Carlo study like detailing how many samples needed, how did you come up with it etc… and answers the questions in parts (1), (2), and (3).

REGULATIONS

1. You have to write your answers to the provided sections of the template answer file given. Other than that, you cannot change the provided template answer file. If a latex structure you want to use cannot be compiled with the included packages in the template file, that means you should not use it.
2. Do not write any other stuff, e.g. question definitions, to answers' sections. Only write your solutions. Otherwise, you will get 0 from that question.
3. **Cheating** : We have zero tolerance policy for cheating}. People involved in cheating will be punished according to the university regulations.
4. You must follow odtuclass for discussions and possible updates on a daily basis.
5. **Evaluation**: Your latex file will be converted to pdf and evaluated by course assistants. The .tex file will be checked for plagiarism automatically using ``black-box'' technique and manually by assistants, so make sure to obey the specifications.

SUBMISSION

Submission will be done via ODTUCLASS. Download the given template file, "the4.tex", when you finish your exam upload your codes and .tex file compressed in a file named the3.zip or the3.tar.gz to ODTUCLASS. Do not use any other compressions.