# CSE 718 – Performance Evaluation of Computer Networks Course

***Marmara University, Istanbul, Turkey***
***January 14, 2015***

## Final Exam

Answer the following questions.

1. Assume that there is an *M/M/1* queue system. In normal conditions, the system operates with an average service rate of $\boldsymbol{\mu}$ and an average arrival rate of $\boldsymbol{\lambda}$. However, when there is no job in the system (empty state), the system doesn't give service until the number of jobs in the system becomes ***3***.

    a. Draw the state transition diagram for the system.

    b. Find the (steady-state) probabilities $\boldsymbol{p_k}$ that there are *k* jobs in the system, where *k=0, 1, 2, …*

    ***c.*** Please give your answers in terms of $\boldsymbol{\lambda, \mu,}$ or $\boldsymbol{\lambda/\mu.}$

    d. Please answer and prove whether the server work more or less than a regular *M/M/1* queuing system.

2. You have studied the TCP flavors in the classroom. In addition to those algorithms, there are many other studies which aim to perform better in some specific conditions. Three such kind approaches are ***TCP Peach***, ***TCP Westwood***, and ***TCP Hybla***. Read the related studies for these three approaches and answer the following questions.

    a. State the differences from other approaches.

    b. State what they outperform and underperform.

    c. Compare with the other approaches in terms of main metrics, e.g. delay, throughput etc.

    NOTE: Don't forget to cite referred sources.

3. In an active queue management, average or instantaneous queue length is used as one of the indicators of the network congestion. Describe the advantages and disadvantages of using the average and instantaneous queue lengths. Give an example to illustrate the situation in which average or instantaneous queue length may fail in indicating network congestion.

This is an individual takehome final exam for the students. Group study, collaboration, and cooperation are not allowed.

Report due date is January 16, 2015 until 15:00. Submit your report via TurnItIn.

Ask any unclear matter to the lecturer. Good luck…

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