Simulation
3-rd and 4-th Year Undergraduate
Mid-Term Examination
2011-12-2 time: 90 minutes (score: each 10)

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1-	What is a simulation?
2-	What kind of problems are with simulation?
3-	Classify simulation models into three different dimensions.
4-	Name two approaches for the simulation clock advancing.
5-	What is the Monte Carlo simulation?
	What are the three measures of the system performance in a single server queuing system?
7-	In which simulation model, a) time is considered? b) random numbers are used?

8-Find the value of the following integral by using the Monte-Carlo method (use 6 points).

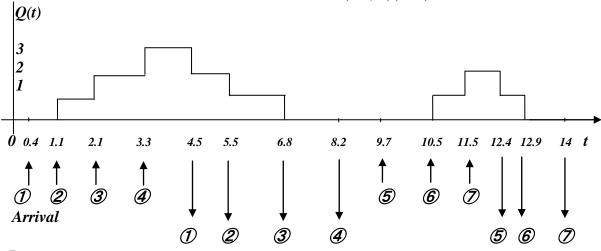
$$I = \int_0^{2\pi} e^{(\cos x)} dx$$

- a) Generate U(0,1) by computer or any means (if you cannot use the following RNG): $U=0.711 \quad 0.520 \quad 0.144 \quad 0.929 \quad 0.291 \quad 0.468$
- b) Use the relation: $X=(2\pi)U$ to map from U(0,1) into $X(0,2\pi)$, then find $\cos(xi)$.
- c) Then use $g(x_i) = e^{(\cos x_i)}$ to find $g(x_i)$ and fill the following table:

Using Monte-Carlo with 6 points: I=

- 9-In the following single server queuing MM1 system, find:
 - a) Average delay in queue (d(n): ADQ).
 - b) Average number of customers in the queue (q(n): ANCQ).
 - c) Efficiency of utilization of the server (u(n): %).

 (i means i th arrival and i means i th departure) (n=7, T(n)=14)



Departure

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