Simulation **University of the Ryukyus**
3-rd Year Undergraduate **Faculty of Engineering**
Mid-Term Examination **Department of Information Eng.**
2002-12-16 **time: 90 minutes** **Prof. Mohammad Reza Asharif**

1-What is iconic model. (10%)

2-What are the events in M/M/1 queue. (10%)

3- What are the state variables in M/M/1 queue. (10%)

4-What is simulation clock? (10%)

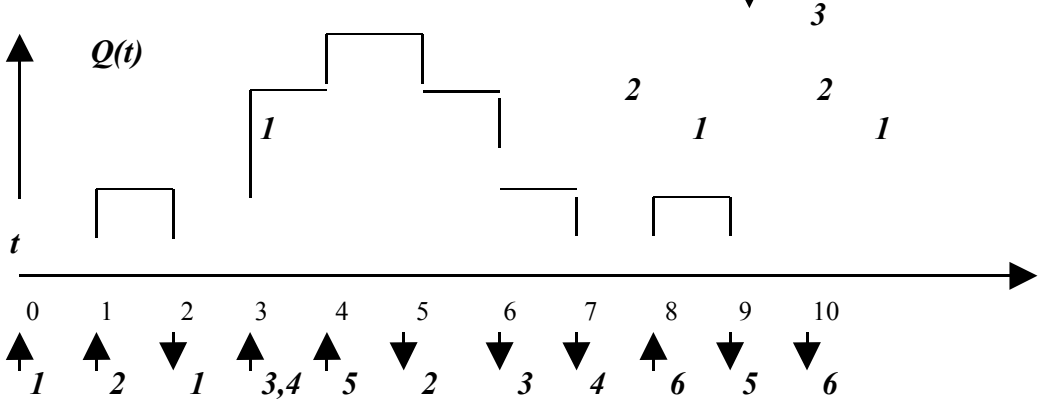
5- Name two approaches for the simulation clock advancing. (10%)

6- What is the Monte Carlo simulation? (10%)

7-In the following single server queuing system, find: (10%)

1) average delay in queue.
2) average number of customers in the queue.
3) efficiency of the utilization of the server. ***(n=6)***

(i means ith arrival)
(j means jth departure)



8- In coffee cooling problem, if we assume that the rate of change (decreasing) of the temperature (T) of the coffee is proportional to the temperature difference, T-Ts (Ts is the air temperature), formulate this problem by a differential equation. (10%)

9-Find the value of the following integral by using Monte-Carlo method and compare with the true value of the integral. (use 11 points as shown in the table) (10%)

$$y = -x^2+4$$

$$\int_0^2 (-x^2 + 4)\,dx$$

i	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***	***11***
n	***0***	***0.2***	***0.4***	***0.6***	***0.8***	***1***	***1.2***	***1.4***	***1.6***	***1.8***	***2***
n^2	***0***	***0.04***	***0.16***	***0.36***	***0 .64***	***1***	***1.44***	***1.96***	***2.56***	***3.24***	***4***
$y_i = -n^2+4$	***4***	***3.96***	***3.84***	***3.64***	***3.36***	***3***	***2.56***	***2.04***	***1.44***	***0.76***	***0***