Problem 1 Explanations

First, I seed rand() in the main function. I ran a 1000 iteration loop which recorded the total sum time of all the service requests with the formula for Poisson distribution, $-(1/\lambda) * \log(z)$, where lambda is 2, and z is a random number generated by rand()/RAND_MAX. I utilized the function from the previous written assignment for this. To generate service times, I used the same value for λ and the exponential distribution formula $-(1/\lambda) * \log(1-y)$. Once this 1000 iteration loop finished running, I had the sums of all 1000 service times and arrival times, and printed those sums/1000 for the average. I ran this by hand 10 times and calculated the averages with a calculator. Note: I did not store a true list of the tuples, since it was not necessary to recall all the data at any later point.

Problem 2 Explanations

For simplicity's sake, I created two vectors to store the results of each event as two separate 'lists' of failures for servers A and B. These vectors stored only 20 years worth of events, so if an event was recorded at any time higher than 20 hours in years, it was not added to its respective list of events.nI used the exponential distribution formula for this as well. I then looped through the two servers' events while there were events left to check and total system failure has not been recorded, comparing the smaller recorded times in hours to the larger ones. If the difference between serverA[i] and serverB[j] is ever less than |10| hours, I record the larger of the two as the total system failure, and break. If the difference is > |10|, I advance the 'pointer' to the smaller of the two events and continue to the next iteration.

Problem 1:

Trial 1
Average service time: 0.527489
Average arrival rate: 0.497561

Trial 2
Average service time: 0.482837
Average arrival rate: 0.472777

Trial 3
Average service time: 0.532539
Average arrival rate: 0.484466

Trial 4
Average service time: 0.498315
Average arrival rate: 0.506089

Trial 5
Average service time: 0.543048
Average arrival rate: 0.510785

Trial 6
Average service time: 0.51817
Average arrival rate: 0.489332

Trial 7
Average service time: 0.479074
Average arrival rate: 0.512837

Trial 8
Average service time: 0.486019
Average arrival rate: 0.526002

Trial 9
Average service time: 0.478726
Average arrival rate: 0.529235

Trial 10
Average service time: 0.512104
Average arrival rate: 0.49831

Problem 2:

Trial 1
Total system failure occurs at 4599.81 hours.

Trial 2
Total system failure occurs at 10603.7 hours.

Trial 3
Total system failure occurs at 33183.1 hours.

Trial 4
Total system failure occurs at 4581.06 hours.

Trial 5
Total system failure occurs at 5798.76 hours.

Trial 6
Total system failure occurs at 38653.8 hours.

Trial 7
Total system failure occurs at 4733.8 hours.

Trial 8
Total system failure occurs at 20453.8 hours.

Trial 9
Total system failure occurs at 7492.15 hours.

Trial 10
Total system failure occurs at 39882.6 hours.

Averages of 10 trials:

Actual service time: **0.5058321**
Actual arrival rate: **0.5027394**
Average time for total system failure to occur: **16998.258**