6. As a new manager of manufacturing of specialty devices for Farr Pharmaceutical Devices, you need to improve turnaround time. You currently are operating one manufacturing line. You did a queuing analysis on the operation, but found the mathematical solution did not accurately model the real world system; therefore, you decide to manually simulate the operation. You analyzed last year’s data and arrived at the following distribution of arrival intervals and service times:

**Distribution of Arrival Intervals**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Arrival Interval (days)** | **Number of**  **Occurrences** | **Probability P(x)** | **Cumulative Probability** | **Random Number Range** |
| **1.0** | **4** |  |  |  |
| **2.0** | **6** |  |  |  |
| **3.0** | **3** |  |  |  |
| **4.0** | **7** |  |  |  |

Manufacturing times are uniformly distributed and vary between 1 and 3 days.

= 1+2r

Use the table below to manually simulate (hint - do **NOT** round your numbers to integer values) the process of your specialty manufacturing operation.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Job #** | **r1** | **Inter-arrival time** | **Total Clock Time** | **Start Manu Time** | **Wait Time** | **Queue Length After Entry** | **r2** | **Manu Time** | **Depart Clock** | **Time in System** |
| 1 | --- | --- | 0 | 0.00 | 0.00 | 0 | 0.93 |  |  |  |
| 2 | 0.06 |  |  |  |  |  | 0.72 |  |  |  |
| 3 | 0.47 |  |  |  |  |  | 0.83 |  |  |  |
| 4 | 0.3 |  |  |  |  |  | 0.35 |  |  |  |
| 5 | 0.97 |  |  |  |  |  | 0.17 |  |  |  |
| 6 | 0.96 |  |  |  |  |  | 0.82 |  |  |  |
| 7 | 0.22 |  |  |  |  |  | 0.63 |  |  |  |
| 8 | 0.16 |  |  |  |  |  | 0.68 |  |  |  |
| 9 | 0.52 |  |  |  |  |  | 0.95 |  |  |  |
| 10 | 0.98 |  |  |  |  |  | 0.07 |  |  |  |

Determine the average waiting time, average queue length, and average time in the system.