ICA 9: Little's Law

ISE 453: Design of PLS Systems Fall 2018

This ICA has five questions that should be submitted.

$$TH = \frac{WIP}{CT}, \quad CT = \frac{WIP}{TH}, \quad WIP = TH \cdot CT, \quad TH = r = r_a\left[y + \gamma(1-y)\right] = \frac{r_d}{y}\left[y + \gamma(1-y)\right]$$

1. If it takes, on average, nine semesters for an undergraduate IE student to graduate and there are, on average, 360 students in the department, how many students, on average, graduate each semester?

2. Given an estimated U.S. population of 325.7 (2017) and a life expectancy of 78 years and 7 months, how many babies are born each year (assuming the population will not increase and ignoring immigration, etc.)?

3. The desired output of FG from a production system is 24 units per hour. The average amount of time each unit of product spends in production is 12 hours. If the yield fraction is 0.8 and all scrap is identified at the end of production, what is the average number of units in process?

4. Assume you are the director for the OR program at NCSU. An administrator is asking you to estimate the number of new Ph.D. students that will be entering your program each year for Graduate Enrollment Target Planning purposes. You currently have 24 Ph.D. students. A quarter of your students leave the program after one year after they fail their Qualifying Exam and the remaining students take another four years to graduate, on average. How many Ph.D. students enter your program each year?

5. If it takes, on average, four hours to visit the North Carolina State Fair and there is expected to be 1,091,887 visitors over the eleven days in October that the fair will be open, how many parking spaces (including on-street) should be provided near the fair so that there is enough space to handle a peak demand that is 150% of the average, assuming three persons per vehicle and that the fair is open from 8 a.m. to midnight each night?