IE 324 SIMULATION
SPRING 2023 HOMEWORK 4

Procedure:

- This homework should be submitted by Friday May 12th at 23:59.
- The grading will be based on effort, so 2: Full Effort, 1: Some Effort, 0: No Effort.

Question 1: Stacks of paper arrive at a trimming process with interarrival times of EXPO(10); all times are in minutes and the first stack arrives at time 0. There are two trimmers, a primary and a secondary. All arrivals are sent to the primary trimmer. If the queue in front of the primary trimmer is shorter than five, the stack of paper enters that queue to wait to be trimmed by the primary trimmer, an operation of duration TRIA(9, 12, 15). If there are already five stacks in the primary queue, the stack is balked to the secondary trimmer (which has an infinite queue capacity) for trimming, of duration TRIA(17, 19, 22). After the primary trimmer has trimmed 25 stacks, it must be shut down for cleaning, which lasts EXPO(30). During this time, the stacks in the queue for the primary trimmer wait for it to become available. Run your simulation for a single replication of 5,000 minutes. Collect statistics, by trimmer, for cycle time, resource utilization, number in queue, and time in queue.

Question 2: Generalize the inventory model (Model 5-4 in the textbook) that was covered in class to have two additional types of items (doodads and kontraptions), as well as widgets; initially, there are 60 widgets, 50 doodads, and 70 kontraptions. The customers arrive in the same pattern as before, but now each customer will have a demand for doodads and kontraptions, as well as for widgets. Widget demands are as before, doodad demands are POIS(1.9), and kontraption demands are POIS(2.3); assume that a customer's demand for an item is independent of his or her demands for the other two items. There's still one inventory evaluator, who still arrives at the beginning of each day, but now has to look at all three inventories and order according to separate (s , S) policies for each of the three inventories; you may "clone" this inventory evaluator for this triple duty, using two tandem instances of the Separate flowchart module. For widgets, (s , S) = (20, 40) as before; for doodads, (s , S) = (15, 35); and for kontraptions, (s , S) = (25, 45). Delivery lags for widgets are UNIF(0.5, 1.0) as before; for doodads, it's UNIF(0.4, 0.8); and for kontraptions, it's UNIF(0.8, 1.7); note that for kontraptions, it's possible for a delivery lag to extend beyond the time of the next inventory evaluation, but make the order decision based on only the inventory on hand, rather than based on the inventory on hand plus on order. Ordering costs (both setup and incremental), holding, and shortage costs for doodads and kontraptions are the same as for widgets. Run the simulation for the same length of time as Model 5-4 (that is, it's okay to fudge the ending point to avoid useless inventory evaluations at time 120), and get the total daily cost, as well as separate holding and shortage costs for each type of item.