The FreshBite Canteen at the University is trying to improve its service during the lunch rush from 11:30 A.M. to 4:00 P.M. Students arrive together in groups of size 1, 2, 3 and 4 with respective probabilities 0.5, 0.3, 0.1 and 0.1. Inter-arrival times between groups are exponentially distributed with mean 3 minutes. Initially the system is empty and idle. Each arriving student, whether alone or part of a group, takes one of the three routes through the canteen (groups generally split up after they arrive):

Route 1: Vada-pav counter, then drinks and then cashier

Route 2: Pizza-bar, then drinks, then cashier

Route 3: Drinks (only) then cashier

The probabilities of these routes are respectively 0.80, 0.15, 0.05. At the Vada-pav counter and at Pizza-bar, students are served one at a time. The drinks stand is self-service and assume that nobody ever has to queue up here. There are two-cashiers, each having its own queue. Students arriving to the cashiers choose the shortest queue. All queues in the model are FIFO.

The service time at the Vada-pav counter appeared to follow uniform distribution, U(a,b) [2\_1.csv attached]. Estimate the parameters and verify that sample collected follows Uniform distribution. The service time at the Pizza-bar appeared to be PT6(α1=3, α2=2, β=3). A sample of time spent at the cash counter was collected [2\_2.csv attached]. You are asked to do the following for the system given above:

• Set up a simulation study till 1000 arrivals. [Note: Each arrival can be a lone student or a group as specified above]

• The average and maximum delay in queue for Vada-pav, Pizza-bar and cashiers (regardless of which cashier).

• The average and maximum total delay in all the queues for each of the three routes separately.

•The time-average and maximum total number of students in the entire system.