**Problem 2:** Consider an M/M/2/3/4 queuing system. Assume that each customer returns to the system, on average, 15 seconds after leaving the system, exponentially distributed. Also assume that each customer, on average, requires 20 seconds of service, exponentially distributed.

- Draw the appropriate state space Markov diagram.
- Give the steady state probability of being in each state.
- Give the system throughput.
- Give the system utilization.
- Give the average response time of a customer.
- Give the mean queue length.
- Give the mean time that a customer waits in the queue without being serviced.

**Problem 3:** Consider a modification of the exercising room example. Suppose there are only two pieces of equipment, the benchpress and the stairmaster. All athletes cycle between the two. However, guys prefer to concentrate on developing their upper body, while gals prefer a more balanced exercise plan. That is, guys typically spend 3 minutes at the benchpress and only 1 minute at the stairmaster, while gals typically spend 2 minutes at each. Gals exercise longer, making 4 cycles between the two pieces of equipment, whereas guys only make 2 cycles. Only one guy and one gal are in the room at a time. When a guy leaves, he is replaced by another guy. Similarly, another gal is waiting to enter the exercise room as soon as one gal finishes. Calculate the total throughput (guys and gals) of athletes leaving the room per hour.