Performance Evaluation of Computer Networks

Assignment #4

1. Consider a computer system with one CPU and one disk used to support a database server. To guarantee acceptable QoS levels, at most two users are allowed to be logged onto the database system at any one time. A typical transaction requires a total of 6 seconds of CPU time and 10 seconds of disk time. Use the Markov model and find the following:
    - **a.** Utilization of resources
    - **b.** System throughput
    - **c.** Number of transactions at each resource
    - **d.** Residence time of transactions at each resource
    - **e.** System response time
2. A web server receives requests at the rate of 15 requests/sec. Measurement data indicate that the average service time of requests is 50 ms.
    - **a.** Draw the generalized birth-death state space diagram of the web server.
    - **b.** Find the probability that the web server is idle.
    - **c.** What is the utilization of web server?
    - **d.** What is the throughput of the server?
    - **e.** What is the response time of the server?
3. Figure 1 depicts the generalized birth-death state space diagram of a system. Use birth-death model and find the following:
    - **a.** Utilization of the system
    - **b.** Throughput of the system.
    - **c.** Number of requests at the system
    - **d.** Response time of the system.

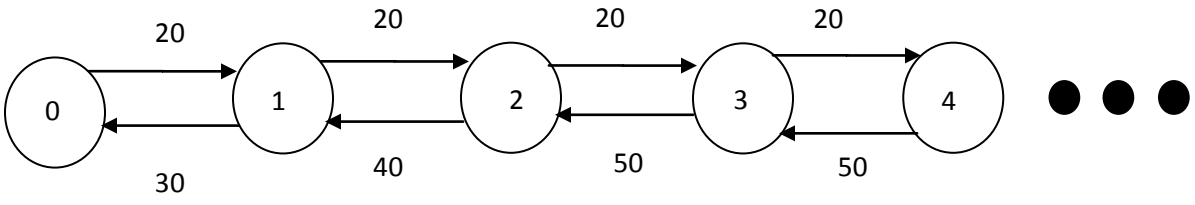

Figure 1. Generalized birth-death state space diagram of the system

4. A system receives requests at the rate of 0.4 requests/sec. The processing time characteristics of a request are E[S] = 1.5 sec and $C_v = 0.3$. What is the average waiting time of a request, if

a. There is no vacation.

b. There is a vacation that lasts one second, on average, and has a coefficient of variation equal to 2.