CSc 841: Computer Performance Evaluation **Dr. Jozo Dujmović**
HOMEWORK: Exponential queuing models

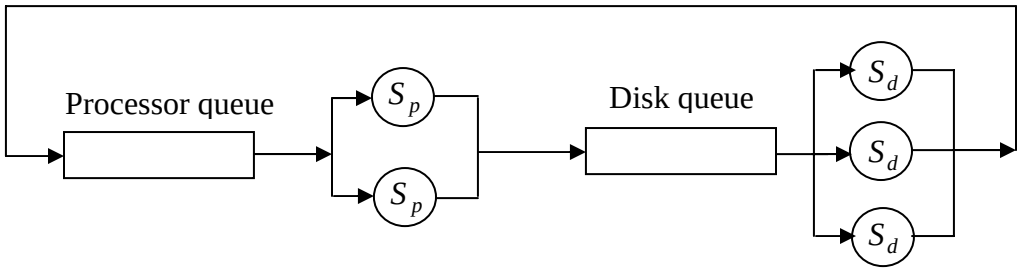

Figure. 1 A queueing model of a computer system with two processors and three disk units

1. Multiprogrammed computer system with 2 processors and 3 disks processes 4 identical programs. We assume that the processors and disks can be modeled as shown in Fig. 1. Each program needs 10 CPU minutes. Processor service time S_p and the disk service time S_d satisfy the relation $S_d = 2S_p$.

(a) Show the state-transition-rate diagram and compute the utilization of each processor.
(b) Compute the response time (i.e. the time for processing the workload of 4 programs in the multiprogrammed environment).
(c) Suppose that one processor is down and the system works with only one active processor. What is the processor utilization? What is the response time?

2. A network server has 2 processors and processes transactions coming from 6 workstations. The average think time is Z=8 sec, and the average processor service time is S=2 sec.

(a) Show the queueing model, the state-transition-rate diagram, and solve the balance equations. Compute the processor utilization, U, and the average response time R.

(b) Compute U and R for a system having a single, but two times faster, processor. What is better: (a) or (b), and why? Compare the curves of response time R(n) for (a) and (b).

(c) In the case (b) what is the critical number of users n^* and what is the response time for n=30?