CAPACITY PLANNING
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Name of the student

Exercise n. 1

Evaluate the reliability and the steady state availability of a system composed of five CPUs (working in parallel and whose output is given by a voter), one RAID 2 system with seven disks, two bus system (working in parallel and whose outputs are given by voters), one keyboard, one printer and one monitor, assuming that the faults can occur according to an exponential distribution with rate equal to λ_{CPU}, λ_{DISK}, λ_{BUS}, λ_{KEY}, λ_{MON}, λ_{PRI}, $\lambda_{VOTER-CPU}$, $\lambda_{VOTER-BUS}$, and with a repair rate as specified in the follow. Evaluate the steady state availability in two case:

- there is a **single** "**repair technician for component type**" and the repair rate is independently by the number of fault occurrences of the same type and the repair rate is equal for all kind of components (μ).
- there are "**two repair technicians for component type**" and they can repair only one component for kind of component and the repair rate is equal for all kind of components (μ).

Exercise n. 2

Evaluate the average response time and throughput for a system composed of 3 parallel servers with a unique finite queue (at most 4 users in the system), with a finite number of users (number of users equal 6), given that the thinking time for each user is exponentially distributed with the average equal to 10 sec , the service time is exponentially distributed with the average service time equal to 3 sec, the MTTF and the MTTR of each server is equal to 1 weeks and to 2 hours, respectively.

Exercise n. 3

A Web site receives 100 requests per second. These requests are served by a computing node composed of 2 CPU working in parallel and by a RAID1 disk system composed of 4 (2+2) disks in total, the server and the mass storage are connected through an Ethernet with a 1 Gbit/sec as bandwidth. The Ethernet is connected to Internet through a router with a delay of 50 microseconds and the router is connected to the ISP through a 0,5 Gibt/sec connection. The incoming requests for reading files are of 300 bytes, instead the average dimension of the requested file is of 200000 bytes. The service time of the CPU to manage a request is of 10 msec, instead the service time for each disk to read 20000 bytes is 20 msec. Evaluate the response time and identify the system bottleneck.

<u>N.B Advice:</u> If you have no time you have at least to show the methodology and analyze the system in a parametric way.