Example for April 13 Lecture

System Availability. Consider a piece of equipment with a finite number of components; suppose that the failure of any one component is a failure for the equipment itself. Let $T_0=0$, T_1, T_2, … be the times of successive failures, and let X_n be the type of component causing the n^{th} failure. The time $T_{n+1} – T_n$ between two failures is the sum of the repair time of the component which failed at T_n and a failure-free interval following the repair. We suppose all components have exponential lifetimes, with the component j having the parameter $\lambda(j)$; and suppose that the repair time of the component j has distribution $t\rightarrow\varphi(j, t)$. Under these assumptions, $\{X_n, T_n\}$ is a Markov renewal process. We need to give the semi-Markov kernel and derive some probability expressions. For the probabilities, we will define Y(t) to denote the component that caused the last failure before time t and let W(t)=1 if the equipment is working at time t and W(t)=0 if a component is under repair at time t. Or goal will be to obtain an expression for $P_i\{Y(t)=j, W(t)=0\}$ and $\lim_{t\rightarrow 0} P_i\{Y(t)=j, W(t)=0\}$.