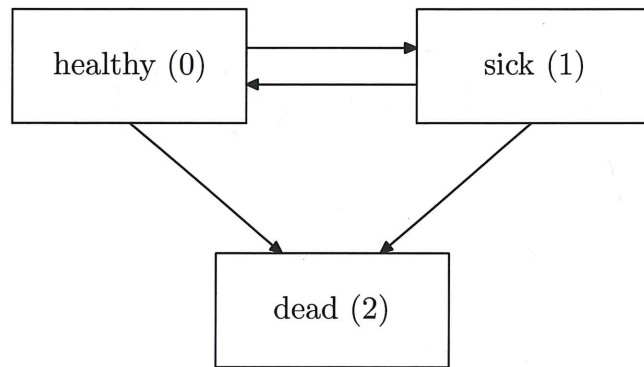


MATH 3631 - Actuarial Mathematics II
Spring 2018 - Valdez
Quiz No. 4
Monday, 5 March 2018

Name: EMIL

Student ID: Suggested Solution

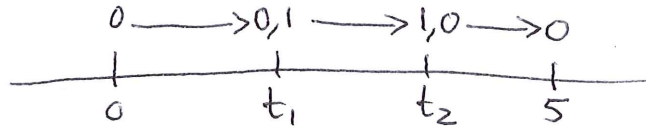
You are given the following health-sickness model:



The forces of transition are independent of age and are given below:

$$\mu^{01} = 0.05 \quad \mu^{10} = 0.02 \quad \mu^{02} = 0.01 \quad \mu^{12} = 0.06$$

Calculate the probability that a "healthy" life will become "sick" exactly once during the next five years and be in "healthy" state at the end of 5 years.



$$\int_0^5 \int_{t_1}^5 t_1 p^{\overline{00}} \mu^{01} t_2 - t_1 p^{\overline{11}} \mu^{10} 5 - t_2 p^{\overline{00}} dt_2 dt_1$$

$$= \int_0^5 \int_{t_1}^5 e^{-.06t_1} .05 e^{-.08(t_2-t_1)} .02 e^{-(5-t_2) .06} dt_2 dt_1$$

$$= (.05)(.02) e^{-.30} \int_0^5 \int_{t_1}^5 e^{.02t_1} e^{-.02t_2} dt_2 dt_1$$

$$\int_0^5 e^{.02t_1} \frac{1}{.02} (e^{-.02t_1} - e^{-.10}) dt_1$$

$$= .05 e^{-.30} \int_0^5 (1 - e^{-.10} e^{.02t_1}) dt_1$$

$$= .05 e^{-.30} \left(5 - e^{-.10} \frac{1}{.02} (e^{.10} - 1) \right)$$

$$= .05 e^{-.30} \left(5 - \frac{1}{.02} (1 - e^{-.10}) \right)$$

$$= 0.36145$$

$$\underline{\underline{0.36145}}$$