

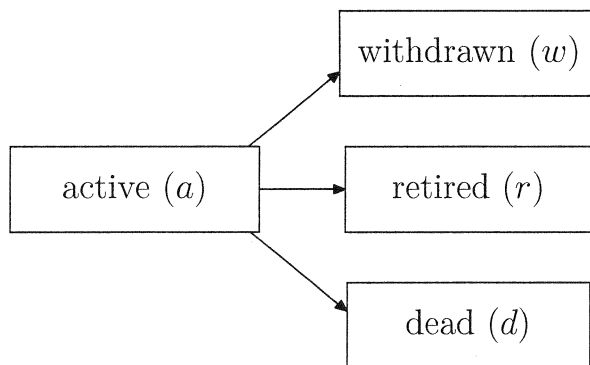
Michigan State University
STT 456 - Actuarial Models II
Class Test 1
Friday, 27 February 2015
BONUS: 20 points

Please write your name at the space provided:

Name: EMIL VALDEZ

- You can earn a total of up to 20 points, to be added to your score in Class Test 1, by answering this one question.
- Please provide details of your workings in the appropriate spaces provided; partial points will be granted.
- Please write legibly. Use the back page for more spaces.
- Only identified students with diligent attendance will have this question marked.

An active (a) employee of a company can leave the company because of one of 3 reasons: voluntary withdrawal (w), retirement (r) or death (d). This is illustrated by the following diagram:



You are given the following forces of transition:

- $\mu^{aw} = 0.030$
- $\mu^{ar} = 0.005$
- $\mu^{ad} = 0.001$

Calculate the probability an active employee, who left the company, left because of retirement.

(Please turn over for more spaces to write your solution.)

EXTRA PAGE FOR DETAILS OF SOLUTION

Assume an active employee left at time t

$$\Pr(\text{Left}) = 1 - \int_0^t .036 ds = 1 - e^{-.036t}$$

$$\begin{aligned} \Pr(\text{retire} | \text{Left}) &= \frac{\Pr(\text{retire, Left})}{\Pr(\text{Left})} \\ &= \frac{\int_0^t .005 e^{-.036s} ds}{1 - e^{-.036t}} \\ &= \frac{.005}{.036} (1 - e^{-.036t}) \\ &= \frac{5}{36} = \underline{0.1388889} \end{aligned}$$

Can also argue that this is indeed equal to

$$\frac{\mu^{ar}}{\mu^{aw} + \mu^{ar} + \mu^{ad}} = \frac{.005}{.036} = \frac{5}{36} \quad \checkmark$$