

King Saud University
College of Sciences
Mathematics Department

Academic Year (G) 2017–2018
Academic Year (H) 1438–1439
Bachelor AFM: M. Eddahbi

Solution of the first midterm exam Summer ACTU. 462 (25%) (two pages)

July 10, 2018 / Shawwal 26, 1439 (two hours 10–12 PM)

Problem 1. (5 marks)

1. (2 Marks) Calculate the net premium for a special fully discrete 20-year term insurance on (30) given the following information:
- The death benefit is 1000 during the first ten years and 2000 during the next ten years.
 - The net premium is π for each of the first ten years and 2π for each of the next ten years.
 - $\ddot{a}_{30:\overline{20}|} = 15.0364$

x	$\ddot{a}_{x:\overline{10} }$	$1000A_{x:\overline{10} }^1$
30	8.7201	16.66
40	8.6602	32.61

2. (3 Marks) Determine the net annual premium for a fully discrete whole life insurance with annual premiums payable for 10 years is issued to (30) given:
- The death benefit is equal to 1000 plus the refund of the net level annual premiums paid without interest.
 - Premiums are calculated in accordance with the equivalence principle.

Problem 2. (5 marks)

For a special fully continuous whole life insurance on (65):

- The death benefit at time t is $b_t = 2000e^{0.05t}$, for $t \geq 0$
- Level premiums are payable for life.
- $\mu_{65+t} = 0.04$, $t \geq 0$ and $\delta = 0.05$

- (1 marks) Find the present value of the future loss, ${}_0L$ and calculate the mean of ${}_0L$,
- (2 marks) Calculate the annual net premium for this life insurance.
- (2 marks) Calculate the premium reserve at the end of year 2.

Problem 3. (5 marks)

For a fully continuous 20-year endowment insurance of 1 on (x): given that

- The force of mortality is constant and equals to 0.02 and $i = 0.06$.
- The premium is determined by the equivalence principle.

- (3 Marks) Calculate the net premium reserve at time 10, ${}_{10}V$ using the prospective approach
- (2 Marks) Calculate the net premium reserve at time 10, ${}_{10}V$ using the retrospective approach