

Dept of Mathematics and Statistics
King Fahd University of Petroleum & Minerals

AS381: Actuarial Contingencies I
Dr. Mohammad H. Omar
Major Exam 3 Term 131 FORM A
Wednesday .Dec 04 2013
7.00pm-8.30pm

Name _____ ID#: _____ Serial #: _____

Instructions.

1. Please **turn off your CELL PHONES** and place them **under your chair**. Any student caught with mobile phones on during the exam will be considered under the **cheating rules** of the University.
2. If you need to leave the room, please do so quietly so not to disturb others taking the test. No two person can leave the room at the same time. No extra time will be provided for the time missed outside the classroom.
3. Only materials provided by the instructor can be present on the table during the exam.
4. Do not spend too much time on any one question. If a question seems too difficult, leave it and go on.
5. Use the blank portions of each page for your work. Extra blank pages can be provided if necessary. If you use an extra page, indicate clearly what problem you are working on.
6. Only answers supported by work will be considered. Unsupported guesses will not be graded.
7. While every attempt is made to avoid defective questions, sometimes they do occur. In the rare event that you believe a question is defective, the instructor cannot give you any guidance beyond these instructions.
8. Mobile calculators, I-pad, or communicable devices are disallowed. Use regular SOA approved scientific calculators or financial calculators only. Write **important steps** to arrive at the solution of the following problems.

The test is 90 minutes, GOOD LUCK, and you may begin now!

Question	Total Marks	Marks Obtained	Comments
1	1+7=8		
2	1+4=5		
3	4+6=10		
4	1+5=6		
5	1+4=5		
6	1+5=6		
Total	40		

Extra blank page

1 (1+7 = 8 points) Find the 40th percentile premium for an insured age 45 for a 50 year endowment insurance plan.

Assume a fully continuous basis with annual interest, $i = e^{0.06} - 1$, and mortality following the Illustrative Life Table.

Solution

2. (1+4=5 points) $L(\pi)$ is the loss-at-issue random variable for a fully discrete whole life insurance of 1000 with level annual premiums π issued to (25). You are given:

(i) Mortality follows de Moivre's law with $\omega = 100$.

(ii) $i = 0.05$.

Calculate the premium π_a such that $L(\pi_a)$ has mean zero.

a) 15.71

b) 15.96

c) 16.21

d) 16.46

e) 16.71

Work Shown (4 points)

Hence the answer is (__)

3. (4+6 = 10 points) On the basis of De Moivre's law with $l_x = 120 - x$ and the interest rate of 4%, calculate

- a. $\bar{P}(\bar{A}_{40})$
- b. ${}_t\bar{V}(\bar{A}_{40})$ and $Var [{}_tL|T(x) > t]$ for $t = 0, 10$.

Solution

(a)

(b)

4. (1+5 = 6 marks) For a special fully discrete whole life insurance of 1000 issued to (75), increasing premiums, π_k are payable at time k , for $k = 0, 1, 2, \dots$. You are given :

(i) $\pi_k = \pi_0(1+i)^k$

(ii) $l_x = 105 - x$ for $x \leq 105$

(iii) $i = 0.05$

(iv) Premiums are calculated in accordance with the equivalence principle.

Calculate π_0 .

a) 33.1

b) 39.7

b) 44.3

c) 51.2

d) 56.4

Work shown (5 points):

Hence the answer is (___)

5. (1+4 = 5 marks) You are given :

(i) ${}_k p_x \cdot q_{x+k} = \frac{0.9^{k+1}}{19}$

(ii) $i = 0.08$

(iii) The force of mortality is constant

Calculate $1000 [\bar{P}(\bar{A}_x) - P(A_x)]$

a) 4.997

b) 5.471

b) 5.970

c) 6.385

d) 6.585

Work shown (4 points):

Hence the answer is (___)

6. (1+5=6 points) For a special fully continuous whole life insurance on (65):

(i) The death benefit at time t is $b_t = 1000e^{0.04t}$, $t \geq 0$

(ii) Level benefit premiums are payable for life.

(iii) $\mu_{65+t} = 0.02$, $t \geq 0$

(iv) $\delta = 0.04$

(The equivalence principle is used for the premiums). Calculate the benefit reserve at the end of year 2.

a) 0

b) 40.81

c) 83

d) 100

e) 129.15

Work Shown (5 points)

Hence the answer is ()

END OF TEST PAPER