

Dept of Mathematics and Statistics
King Fahd University of Petroleum & Minerals
AS380: Actuarial Contingencies 1
Dr. Ridwan A. Sanusi
Major Exam 1 Term 241
Tuesday, October 1, 2024
7.00 PM - 9.00 PM

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 exam time will be provided for the time spent outside the room.
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. ***Only answers supported by work will be considered. Unsupported guesses will not be graded.***
9. Mobile calculators, I-pad, or communicable devices are disallowed. Use regular scientific calculators, financial calculators, or SOA-approved calculators only. ***Write important steps to arrive at the solution of the exam problems.***

The test is 120 minutes, GOOD LUCK, and you may begin now!

Question	Total Point	Point Obtained	Comments
1	10		
2	2		
3	4		
4	6		
5	8		
Total	30		

Extra blank page

1. You are given

$$p_x = 0.99, \quad p_{x+1} = 0.985, \quad {}_3p_{x+1} = 0.95, \quad \text{and} \quad q_{x+3} = 0.02.$$

Calculate (a) p_{x+3} , (b) ${}_2p_x$, (c) ${}_2p_{x+1}$, (d) ${}_3p_x$, (e) ${}_1|_2q_x$.

2. Given

$$e_x = p_x(1 + e_{x+1}),$$

Calculate ${}_3p_{60}$ from the following Table.

x	e_x
60	15.96
61	15.27
62	14.60
63	13.94

3. Suppose that the Gompertz' law applies with $B = 0.00013$ and $c = 1.03$.

Calculate (a) ${}_{10}p_{40}$ and (b) $\frac{d}{dt} {}_tP_{40}$ at $t = 10$.

4. The function

$$G(x) = \frac{18\,000 - 110x - x^2}{18\,000}$$

has been proposed as the survival function $S_0(x)$ for a mortality model.

- (a) What is the implied limiting age ω ?
- (b) Verify that the function G satisfies the criteria for a survival function.
- (c) Calculate ${}_{20}p_0$.

5.

You are given the following life table extract.

Age, x	l_x
52	89 948
53	89 089
54	88 176
55	87 208
56	86 181
57	85 093
58	83 940
59	82 719
60	81 429

Calculate

- (a) $0.2q_{52.4}$ assuming uniform distribution of deaths between integer ages,
- (b) $5.7p_{52.4}$ assuming uniform distribution of deaths between integer ages,
- (c) $3.2|2.5q_{52.4}$ assuming constant force of mortality between integer ages
- (d) $1.7q_{33}$ assuming constant force of mortality between integer ages