Student Name:_____

Purdue ID:_____

STAT 472 – Spring 2025
Quiz 6

MTHW 304 12:50 – 1:15 PM
Tuesday, April 20th, 2025

INSTRUCTIONS

- Do not open this quiz until you are told to do so.
- There are 20 points possible on this quiz.
- You have 25 minutes to complete this quiz.
- Be sure you have filled in your name and Purdue ID in the slots at the top of the page.
- Show all work to maximize partial credit.
- Be sure all cell phones are silenced and put away out of view. This policy applies to smart watches as well.
- Headphones are not permitted unless prior approval was granted by your instructor.
- Formula sheets are not permitted.
- You are only permitted to use calculator(s) from the following list:
    - BA II Plus
    - BA II Plus Professional
    - BA-35
    - TI–30Xa or TI–30XA (same model just different casing)
    - TI-30X II (IIS solar or IIB battery)
    - TI-30XS MultiView (or XB battery)
- When time expires, put your pencil down and close your exam. Failure to do so will result in automatic disqualification from obtaining University-Earned Credit.

PURDUE HONORS PLEDGE

"As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue."

STUDENT AGREEMENT

By signing below,

- I agree with the Purdue Honors Pledge stated above.
- I will not give or receive any assistance on this exam, and I will report any infractions of the honors pledge.
- I acknowledge that I only used calculator(s) from the above list.
- I am claiming all work in this exam as my own.

X_____

1. (5 points) A term insurance policy to (40) pays a death benefit of 105,000 for 20 years at the end of the year of death. Premiums are paid at the beginning of each year for the length of the policy.

   You are given the following:

   i. Mortality follows the Standard Ultimate Life Table
   ii. $i = 0.05$
   iii. Expenses as follows:
      1. Issue Expense at time 0 of 925.
      2. Maintenance expense of 37 at the start of every year including the first year.
      3. Termination expense of 1500 paid at the end of the year of death.
      4. Commissions of 50% in the first year and 10% thereafter

   ii. P^g is the gross premium calculated using the equivalence principle.

   iii. The policy premium, P, is set to be $P = P^g + 100$.

   Calculate P (round to 2 decimals).

$A_{40:\overline{20}|} = 20 E_{40}$

or

$A_{40} - 20 E_{40} A_{60} = 0.12706 - (0.96463)(0.29028)$

$= 0.01463$

$PVP = PVB + PVE$

$P^g \ddot{a}_{40:\overline{20}|} = (105{,}000 + 1500) A^1_{40:\overline{20}|} + 37 \ddot{a}_{40:\overline{20}|} + 925 + 0.10 P^g \ddot{a}_{40:\overline{20}|} + 0.40 P^g$

$\ddot{a}_{40:\overline{20}|} = 12.9935$

$(0.90(12.9935) - 0.40) P^g = (106{,}500)(0.01463) + 37(12.9935) + 925$

$P^g = 262.42$

$P = 262.42 + 100 = \boxed{362.42}$

Points	
1	Correct equation PVP=PVB+PVE and addition of 100 to EP premium
1	Correct setup for PVP
1	Correct setup for PVB
2	Correct setup for PVE

2. (10 points) Calculate the following gross premium policy value amounts using P from problem 1 as the premium and complete the table. If you did not solve for a reasonable premium in Part 1, use 375.

	Value
${}_0V^g$	
${}_{10}V^g$	
${}_{11}V^g$	
${}_{20}V^g$	

* reserve at time 0 is not zero since premium is not the premium calculated using EP (we added 100). reserve at end of term is 0,
∴ ${}_{20}V^g = 0$

	Value
${}_0V^g$	-1129.37
${}_{10}V^g$	-773.36
${}_{11}V^g$	-637.92
${}_{20}V^g$	0

${}_0V^g$ = PVFB + PVFE − PVFP

$= 106{,}500\,A^1_{40:\overline{20}|} + 925 + 37\ddot{a}_{40:\overline{20}|} + 0.4P + 0.1P\ddot{a}_{40:\overline{20}|} - P\ddot{a}_{40:\overline{20}|}$

$A^1_{40:\overline{20}|} = 0.01463$, $\ddot{a}_{40:\overline{20}|} = 12.9935$, $0.4P = 362.42$

$= -1{,}129.37$

${}_{10}V^g = 106{,}500\,A^1_{50:\overline{10}|} + 37\ddot{a}_{50:\overline{10}|} + 0.1P\ddot{a}_{50:\overline{10}|} - P\ddot{a}_{50:\overline{10}|}$

$A^1_{50:\overline{10}|} = A_{50:\overline{10}|} - {}_{10}E_{50} = 0.41643 - 0.40182 = 0.01461$, $\ddot{a}_{50:\overline{10}|} = 8.055$

$= -773.364$

→ can calculate ${}_{11}V^g$ using recursive or same method as above.

$${}_{11}V^g = \frac{({}_{10}V^g + P - e - X^{BOY})(1.05) - 106{,}500\,q_{50}}{p_{50}}$$

$$= \frac{(-773.36 + 362.42 - 0.10(362.42) - 37)(1.05) - 106{,}500(0.001209)}{1 - 0.001209}$$

$\therefore -637.921$

Points	
3	Correct setup for ${}_0V^g$ • 1 point for recognizing that should not be 0 since built in profit • 2 points for rest of the setup
3	Correct setup for ${}_{10}V^g$
3	Correct setup for ${}_{11}V^g$, recursive or direct
1	Correctly identify that ${}_{20}V^g = 0$

3. (5 points) This is a freebie. **List a song title and artist for a song that you've been listening to lately** and I'll put together a class playlist. (Don't worry about keeping it G-rated for me – I want to know what you really listen to.)

   Me: Glide – NEIKED, Portugal. The Man
   My kids: Dance the Night – Dua Lipa