Student Name:_____

Purdue ID:_____

MA 373 – Spring 2025
Optional Quiz 6

MA 175 10:30 – 11:55 AM
TUESDAY, APRIL 29th, 2025

INSTRUCTIONS

- Do not open this quiz until you are told to do so.
- There are 20 points possible from 4 problems, 2 worth 4 points and 2 worth 6 points.
- 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. (4 points) You are receiving a monthly annuity that pays 700 at the end of the odd months (1, 3, 5, 7, 9, and 11), and 150 at the end of the even months (2, 4, 6, 8, 10, and 12) for 2 years.

   At a monthly effective interest rate of 1.5%, calculate the present value of this annuity to two decimal places.

   Solution:

$$PV = 700a_{\overline{24}|i^{(12)}/12} - 550a_{\overline{12}|i^{(6)}/6}$$

$$\frac{i^{(12)}}{12} = 0.015$$

$$\left(1+\frac{i^{(6)}}{6}\right)^{6} = (1.015)^{12}, \text{ therefore, } \frac{i^{(6)}}{6} = 0.030225$$

$$PV = 700\left(\frac{1-\left(\frac{1}{1.015}\right)^{24}}{0.015}\right) - 550\left(\frac{1-\left(\frac{1}{1.030225}\right)^{12}}{0.030225}\right) = 8553.927453$$

2. (4 points) You are the beneficiary of a deferred annuity. The deferred annuity will pay you 48 monthly payments of 500 with the first payment at the end of 4 months.

   Given an interest rate of 9% compounded monthly, calculate the present value of your annuity to two decimal places.

   Solution:

   $$n = 48,\ i^{(12)} = 0.09 \Rightarrow \frac{i^{(12)}}{12} = \frac{0.09}{12} = 0.0075$$

   $$PMT_{Monthly} = 500$$

   $$PV\left(\text{at Month } 3\right) = P_3$$

   Using the Annuity Formula:

   $$P_3 = \left(500\right)\left(\frac{1-\left(1.0075\right)^{-48}}{0.0075}\right) = 20,092.39$$

   Alternatively, you can use the BA-II Plus:

   $$\boxed{N} \leftarrow 48;\ \boxed{PMT} \leftarrow 500;\ \boxed{I/Y} \leftarrow 0.75\ \boxed{CPT}\ \boxed{PV}\ \Rightarrow 20,092.39 = P_3$$

   Lastly, we need to discount this to Month 0:

   $$PV\left(\text{at Month } 0\right) = \left(20,092.39\right)\left(1.0075\right)^{-3} = 19,647.00951$$

3. (6 points) Person A invests 1,200 in an account earning simple interest of 8% per year.

   Person B invests 1,200 in an account earning compound interest.

   During the 7th year, they earn the same annual effective interest rate.

   How much money does Person B have at the end of 10 years?

   Solution:

$$PersonA \Longrightarrow i_n = \frac{s}{1+s(n-1)} \Longrightarrow i_7 = \frac{0.08}{1+(0.08)(7-1)} = 0.054054054$$

$$PersonB \Longrightarrow i_n = i \Longrightarrow i_7 = 0.054054054 \Longrightarrow i = 0.054054054$$

$$\text{Person B has } (1,200)(1.054054054)^{10} = 2,031.468421$$

4. (6 points) A 10,000 par-value 10-year bond with r % annual coupons and redeemable at par is bought at a premium to yield an annual effective yield rate of 5%.

   The interest portion of the 5th coupon is 558.82.

   Calculate r.

   Solution:

$$B_4 = 10,000ra_{\overline{6}|0.05} + 10,000\left(\frac{1}{1.05}\right)^6$$

$$I_5 = i\left(B_4\right) = \left(0.05\right)\left(10,000ra_{\overline{6}|0.05} + 10,000\left(\frac{1}{1.05}\right)^6\right) = 558.82$$

$$10,000r\left(5.075692067\right) + 7,462.153966 = 11,176.40$$

$$r = 0.073177135$$

*Technically r=7.3177 since it was defined as r%, but accepted either 7.3177 or 0.073177.