

MAP 4170
Test 1

Name: _____
Date: February 1, 2022

Show sufficient work and clearly mark your answers. Each problem is worth 10 points.

1. Cathy is to receive payments of 3000 in 3 years and 5000 in 6 years. Using a nominal interest rate of i , compounded quarterly, the present value of the payments is 7622. Using the same interest rate, if Cathy invested 2000 for 4 years, the accumulated value would be Y . Determine Y .
 - (A) 2070
 - (B) 2080
 - (C) 2090
 - (D) 2100
 - (E) 2110

2. An account credits interest using a force of interest $\delta_t = 0.02t + 0.01$ where t is the number of years after 1/1/2020. If 1000 is deposited into the account on 1/1/2020, determine the amount of interest earned on this deposit during calendar year 2021.
 - (A) 40.81
 - (B) 41.21
 - (C) 41.64
 - (D) 60.59
 - (E) 61.84

3. The quoted rate for a 90-day Canadian T-Bill is half the quoted rate for a 180-day U.S. T-Bill. A 90-day Canadian T-Bill with a redemption value of 1000 is priced at 990. To the nearest dollar, determine the price of a 180-day U.S. T-Bill with a redemption value of 1000.

(A) 957

(B) 958

(C) 959

(D) 960

(E) 961

4. Account A credits interest using a simple discount rate of 5%. Account B credits interest using a quarterly effective interest rate, i . At time $t = 2$, the forces of interest in the two accounts are equal. Determine the amount that needs to be deposited into Account B in order for there to be 1000 in the account after 3 years.

(A) 825

(B) 830

(C) 835

(D) 840

(E) 845

5. Given a force of interest $\delta_t = \frac{kt}{2+t^2}$, an amount of 1000 at time $t = 5$ discounts to 800 at time $t = 1$. Determine the equivalent value at time $t = 3$.
- (A) 887
(B) 894
(C) 900
(D) 906
(E) 913
6. An account credits interest using a simple interest rate, i , for the first quarter of the first year, and an interest rate of i compounded quarterly thereafter. An initial deposit of 1000 accumulates to 1325 after 2.5 years. Determine the amount the initial deposit has accumulated to after 5 years.
- (A) 1600
(B) 1650
(C) 1700
(D) 1750
(E) 1800

7. An account credits interest using a simple interest rate of 5%. Determine the ratio $\frac{i_5}{d_5}$, where i_5 is the equivalent annual effective interest rate for the 5th year and d_5 is the equivalent annual effective discount rate for the 5th year.
- (A) $\frac{23}{24}$
- (B) $\frac{24}{25}$
- (C) 1
- (D) $\frac{25}{24}$
- (E) $\frac{24}{23}$
8. For an account that credits interest using a nominal interest rate of i , compounded monthly, a deposit 14,000 accumulates to 126,000 after $2k$ years. Determine the amount needed to be deposited into this account in order for the deposit to accumulate to 45,000 after k years.
- (A) 15,000
- (B) 16,000
- (C) 17,000
- (D) 18,000
- (E) 19,000

9. Judy is to receive payments of X in 1 year and $2X$ in 2 years. Jon is to receive payments of X in 3 years and $2X$ in 4 years. Using an annual effective discount rate of d , the present value of Jon's payments is equal to 81% of the present value of Judy's payments. Determine d .
- (A) 10%
 - (B) 11%
 - (C) 12%
 - (D) 13%
 - (E) 14%
10. An account credits interest using a simple discount rate of 3% for the first two years, a nominal discount rate of 4% compounded biannually for the third year, and a force of interest equal to 5% thereafter. Determine the equivalent annual effective interest rate over the first 5-year period.
- (A) less than 4.13%
 - (B) greater than or equal to 4.13%, but less than 4.18%
 - (C) greater than or equal to 4.18%, but less than 4.23%
 - (D) greater than or equal to 4.23%, but less than 4.28%
 - (E) greater than or equal to 4.28%