AS201: Financial Mathematics

Department of Mathematics

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Major Exam 2

December 1, 2025

Name: ______________________________ **ID:** ______________________

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. 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.

9. **Important:** Questions 1-9 are calculation problems worth 3 points each (1 point for correct option, 2 points for correct working). Questions 10-18 are conceptual questions worth 1 point each (no working required). You are expected to spend approximately 90 minutes on Questions 1-9.

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

Questions

Question 1.
An amortized loan has 10 annual payments at the end of each year starting one year from now. The first 5 payments are \$1000 each and the final 5 payments are \$500 each. Interest is at an effective annual rate of 10%. Find the interest and principal in the 4th payment.

A. 230.16, 4967.88
B. 3301.59, 330.16
C. 330.16, 669.84
D. 230.16, 867.77
E. 769.84, 230.16

Question 2.
A loan of amount 1000 at a nominal annual interest rate of 12% compounded monthly is repaid by 6 monthly payments, starting one month after the loan is made. The first three payments are amount X each and the final three payments are amount 2X each. Based on the amortization schedule provided, what is the interest due at time 2 and the outstanding balance at time 5?

A. 8.94, 228.93
B. 10.00, 894.39
C. 7.88, 679.99
D. 6.80, 455.58
E. 4.56, 455.58

Question 3.
Bond A has n coupons remaining at rate r each, and sells to yield rate i effective per coupon period. Bond B has the same face value and number of coupons remaining as Bond A, but the coupons are at rate r each and the yield rate is i effective per period. If $i_2 \cdot r_1 = i_1 \cdot r_2$ and $i_2 > i_1 > r_1$, which of the following statements are true?

I. The price of Bond B exceeds the price of Bond A.
II. The present value of Bond B's coupons on the purchase date exceeds the present value of Bond A's coupons.
III. The present value of the redemption amount for Bond B exceeds the corresponding present value for Bond A.

A. I only
B. II only
C. III only
D. I and II only
E. II and III only

Question 4.
A 20-year 8% bond has semi-annual coupons and a face amount of 100. It is quoted at a purchase price of 70.400 (in decimal form, not 1/32). Suppose that the bond was issued January 15, 2000, and is bought by a new purchaser on April 1, 2005 for a market price of 112.225. Find the yield rate for the new purchaser.

A. 6.25% effective per year
B. 3.12% effective per half-year
C. 6.50% effective per year
D. 3.25% effective per half-year
E. 7.00% effective per year

Question 5.

A pension fund receives contributions and pays benefits from time to time. The fund began the year 2009 with a balance of $1,000,000. There were contributions to the fund of $200,000 at the end of February and again at the end of August. There was a benefit of $500,000 paid out of the fund at the end of October. The balance remaining in the fund at the start of the year 2010 was $1,100,000. Find the dollar-weighted return on the fund, assuming each month is 1/12 of a year.

A. 5.00%
B. 7.14 - mistake, it should be 17.4%
C. 8.33%
D. 9.09%
E. 10.00%

Question 6.

The details regarding fund value, contributions and withdrawals from a fund are as follows:

Date	Fund Value	Transaction
1/1/05	1,000,000	
7/1/05	1,310,000	
6/30/05		Contribution: 250,000
1/1/06	1,265,000	
12/31/05		Benefits: 150,000
7/1/06	1,540,000	
6/30/06		Contribution: 250,000
1/1/07	1,420,000	
12/31/06		Benefits: 150,000

Find the effective annual time-weighted rate of return for the two-year period of 2005 and 2006.

A. 8.5%
B. 9.1%
C. 9.5%
D. 10.0%
E. 10.5%

Question 7.
Seth repays a 30-year loan with a payment at the end of each year. Each of the first 20 payments is 1200, and each of the last 10 payments is 900. Interest on the loan is at an annual effective rate of i, i ¿ 0. The interest portion of the 11th payment is twice the interest portion of the 21st payment. Calculate the interest portion of the 21st payment.

A. 250
B. 275
C. 300
D. 325
E. There is not enough information to calculate the interest portion of the 21st payment.

Question 8.
Claire purchases an eight-year callable bond with a 10% annual coupon rate payable semiannually. The bond has a face value of 3000 and a redemption value of 2800. The purchase price assumes the bond is called at the end of the fourth year for 2900, and provides an annual effective yield of 10.0%. Immediately after the first coupon payment is received, the bond is called for 2960. Claire's annual effective yield rate is i. Calculate i.

A. 9.8%
B. 10.1%
C. 10.8%
D. 11.1%
E. 11.8%

Question 9.
A bank issues two 20-year bonds, A and B, each with annual coupons, an annual effective yield rate of 10%, and a face amount of 1000. The total combined price of these two bonds is 1600. Bond B's annual coupon rate is equal to Bond A's annual coupon rate plus 1 percentage point. Calculate the annual coupon rate of Bond A.

A. 6.46%
B. 7.15%
C. 7.29%
D. 8.02%
E. 8.90%

Question 10.
For a callable bond selling at a premium (price >face value), which of the following is true regarding the yield calculation?

A. The issuer will likely call the bond at maturity to maximize investor yield
B. The minimum yield for the investor occurs if the bond is called at the earliest call date
C. The minimum yield for the investor occurs if the bond is held to maturity
D. The bond's coupon rate is less than the market yield rate
E. The yield to call is always higher than the yield to maturity

Question 11.
For a callable bond selling at a discount (price <face value), which of the following is true regarding the yield calculation?

A. The issuer will likely call the bond early to refinance at lower rates
B. The minimum yield for the investor occurs if the bond is called at the earliest call date
C. The minimum yield for the investor occurs if the bond is held to maturity
D. The bond's coupon rate is greater than the market yield rate
E. The yield to call is always higher than the yield to maturity

Question 12.
When calculating the yield to worst for a callable bond, an investor should consider:

A. Only the yield to maturity
B. Only the yield to the earliest call date
C. Both yield to maturity and yield to all possible call dates, taking the minimum
D. Both yield to maturity and yield to all possible call dates, taking the maximum
E. The average of yield to maturity and yield to call

Question 13.
A callable bond with a coupon rate of 6% is selling at par when market rates are 6%. If market rates drop to 5%, what is most likely to happen?

A. The bond price will decrease and the issuer will call the bond
B. The bond price will increase and the issuer will not call the bond
C. The bond price will increase and the issuer will call the bond
D. The bond price will decrease and the issuer will not call the bond
E. The bond price will remain at par

Question 14.
In an amortized loan with level payments, which of the following is true about the interest and principal portions of each payment?

A. The interest portion increases over time while the principal portion decreases
B. The interest portion decreases over time while the principal portion increases
C. Both interest and principal portions remain constant
D. The interest portion is constant while the principal portion increases
E. The interest portion increases while the principal portion is constant

Question 15.
For a loan being repaid by the sinking fund method with level payments, which of the following is true?

A. The borrower pays only interest each period and a lump sum at maturity
B. The borrower pays increasing amounts of principal each period
C. The borrower pays level total payments covering both interest and principal
D. The borrower pays interest to the lender and makes deposits to a separate fund that accumulates to the loan principal
E. The outstanding balance decreases linearly over time

Question 16.
The outstanding balance of an amortized loan immediately after a payment is equal to:

A. The original loan amount minus total principal paid to date
B. The present value of all future payments
C. The accumulated value of all past payments
D. The future value of the remaining payments
E. Both A and B are correct

Question 17.
The net present value (NPV) of an investment is:

A. The difference between the present value of cash inflows and present value of cash outflows
B. The annual effective rate that makes the present value of cash flows equal to zero
C. The accumulated value of all cash flows at the end of the investment period
D. The ratio of total returns to total investment
E. The time-weighted rate of return on the investment

Question 18.
Which of the following statements about dollar-weighted and time-weighted returns is correct?

A. Dollar-weighted return is affected by the timing of cash flows, while time-weighted return is not
B. Time-weighted return is affected by the timing of cash flows, while dollar-weighted return is not
C. Both are equally affected by the timing of cash flows
D. Neither is affected by the timing of cash flows
E. Dollar-weighted return is always higher than time-weighted return

Solutions and Answers

Solution to Question 1: (source: Exercise 3.1.1 iii – Ass 2)
To find the interest and principal in the 4th payment:

Interest in 4th payment: $I_4 = i \times OB_3$

$$\begin{aligned} &\text{We need } OB_3 \text{ : After 3 payments, remaining payments are:} \\ &\quad 1000 \text{ at } t = 4, 1000 \text{ at } t = 5, 500 \text{ at } t = 6, \ldots, 500 \text{ at } t = 10 \\ OB_3 &= 1000a_{\overline{2}|0.10} + 500v^2 a_{\overline{5}|0.10} \\ &= 1000(1.735537) + 500(0.826446)(3.790787) \\ &= 1735.54 + 1566.05 = 3301.59 \\ I_4 &= 0.10 \times 3301.59 = 330.16 \\ PR_4 &= 1000 - 330.16 = 669.84 \end{aligned}$$

Answer: **C. 330.16, 669.84**

Solution to Question 2: (source: Example 3.1)
From the amortization schedule provided:

- Interest due at time 2: $I_2 = OB_1 \times i = 894.39 \times 0.01 = 8.94$
- Outstanding balance at time 5: $OB_5 = 228.93$

(Note: Monthly interest rate = 12%/12 = 1% = 0.01)

Answer: **A. 8.94, 228.93**

Solution to Question 3:(source: Exercise 4.1.11 – Ass. 3)
Let F = face value, n = number of coupons remaining.
Bond price formula: $P = Fra_{\overline{n}|i} + Fv^n$

Given $i_2 r_1 = i_1 r_2 \Rightarrow \frac{r_1}{i_1} = \frac{r_2}{i_2} = k$ (say), where $k < 1$ since $i_1 > r_1$.

For Bond A: $P_A = Fr_1 a_{\overline{n}|i_1} + Fv_1^n$
For Bond B: $P_B = Fr_2 a_{\overline{n}|i_2} + Fv_2^n$

We can rewrite using $r_1 = ki_1$ and $r_2 = ki_2$:

$$P_A = F[ki_1 a_{\overline{n}|i_1} + v_1^n] = F[k(1 - v_1^n) + v_1^n] = F[k + (1 - k)v_1^n]$$

$$P_B = F[ki_2 a_{\overline{n}|i_2} + v_2^n] = F[k(1 - v_2^n) + v_2^n] = F[k + (1 - k)v_2^n]$$

Since $i_2 > i_1$, we have $v_2^n < v_1^n$ (present value factor is smaller for higher yield).
Since $k < 1$, we have $(1 - k) > 0$.
Thus $P_B = F[k + (1 - k)v_2^n] < F[k + (1 - k)v_1^n] = P_A$.

So statement I is **false** (Bond B's price is lower than Bond A's price).

For statement II: Present value of coupons:

$$\text{PV}_{\text{coupons,A}} = Fr_1 a_{\overline{n}|i_1} = Fk(1 - v_1^n)$$

$$\text{PV}_{\text{coupons,B}} = Fr_2 a_{\overline{n}|i_2} = Fk(1 - v_2^n)$$

Since $v_2^n < v_1^n$, we have $1 - v_2^n > 1 - v_1^n$, so:

$$\text{PV}_{\text{coupons,B}} > \text{PV}_{\text{coupons,A}}$$

Thus statement II is **true**.

For statement III: Present value of redemption:

$$\text{PV}_{\text{redemption,A}} = Fv_1^n$$

$$\text{PV}_{\text{redemption,B}} = Fv_2^n$$

Since $v_2^n < v_1^n$, we have:

$$\text{PV}_{\text{redemption,B}} < \text{PV}_{\text{redemption,A}}$$

Thus statement III is **false**.

Only statement II is true.
Answer: **B. II only**

Solution to Question 4: (source: Example 4.3)

Semiannual coupon =

$$C = 0.08 \times 100/2 = 4.$$

Time fraction between last coupon (Jan 15) and purchase date (Apr 1):

$$h = \frac{76}{181}.$$

Remaining coupons:

$$N = 30.$$

We solve for j, the 6-month yield rate, in the equation:

$$112.225 = \left[4\, a_{\overline{30}\,|\,j} + 100\, v^{30} \right].$$

Solving numerically:

$$j = 0.033479.$$

The Nominal annual yield convertible semiannually:

$$i^{(2)} = 2j = 0.06696.$$

The Effective annual yield:

$$i_{\text{eff}} = (1 + j)^2 - 1,$$

$$i_{\text{eff}} = 0.06808 \approx 0.07.$$

Solution to Question 5: (source: Example 5.3)
Dollar-weighted return (also called internal rate of return) solves:

$$\text{Initial Balance} + \sum \text{Contributions} \times (1+i)^t - \sum \text{Withdrawals} \times (1+i)^t = \text{Final Balance}$$

where t is time from transaction to end of year.

Given:

- Initial balance: \$1,000,000 at $t = 0$ (start of 2009)
- Contribution: \$200,000 at end of February ($t = 10/12$ months remaining)
- Contribution: \$200,000 at end of August ($t = 4/12$ months remaining)
- Benefit (withdrawal): \$500,000 at end of October ($t = 2/12$ months remaining)
- Final balance: \$1,100,000 at end of year ($t = 0$ from end perspective)

Let i be the annual dollar-weighted return. Using end of year as comparison date:

$$1,000,000(1+i)+200,000(1+i)^{10/12}+200,000(1+i)^{4/12}-500,000(1+i)^{2/12} = 1,100,000$$

Simplify: All terms to end of year:

$$1,000,000(1 + i) + 200,000(1 + i)^{5/6} + 200,000(1 + i)^{1/3} - 500,000(1 + i)^{1/6} = 1,100,000$$

We can approximate by assuming simple interest approximation for dollar-weighted return:

$$I = \text{Interest earned} = 1,100,000+500,000-(1,000,000+200,000+200,000) = 1,600,000-1,400,000 =$$

$$\text{Average amount invested} \approx A_0 + \sum C_t \times (1 - t)$$

where t is time from start to transaction (in years).

Times from start:

- Contribution Feb 28: $t = 2/12 = 1/6$
- Contribution Aug 31: $t = 8/12 = 2/3$
- Withdrawal Oct 31: $t = 10/12 = 5/6$

Average amount:

$$A_{\text{avg}} \approx 1,000,000 + 200,000(1 - 1/6) + 200,000(1 - 2/3) - 500,000(1 - 5/6)$$
$$= 1,000,000 + 200,000(5/6) + 200,000(1/3) - 500,000(1/6)$$
$$= 1,000,000 + 166,666.67 + 66,666.67 - 83,333.33$$
$$= 1,150,000$$

Dollar-weighted return approximation:

$$i \approx \frac{I}{A_{\text{avg}}} = \frac{200,000}{1,150,000} \approx 0.1739\ (17.39\%)$$

Solution to Question 6: (source: Ass 3 and Exercise 5.2.1)
Time-weighted return is calculated by finding the growth factors for each subperiod between cash flows, then linking them geometrically.

First, organize the data chronologically with correct transaction timing:

- Jan 1, 2005: Fund value = 1,000,000
- Jun 30, 2005: Contribution of 250,000 (this happens before July 1 value)
- Jul 1, 2005: Fund value = 1,310,000 (this is after the contribution)
- Dec 31, 2005: Benefits paid = 150,000
- Jan 1, 2006: Fund value = 1,265,000 (this is after the benefits)
- Jun 30, 2006: Contribution of 250,000
- Jul 1, 2006: Fund value = 1,540,000 (after contribution)
- Dec 31, 2006: Benefits paid = 150,000
- Jan 1, 2007: Fund value = 1,420,000 (after benefits)

Now calculate subperiod returns:

Period 1: Jan 1, 2005 to Jun 30, 2005
Starting value: 1,000,000
Contribution at end of period: +250,000
Value just before contribution is unknown, but value after contribution on Jul 1 is 1,310,000.
So: Value before contribution + $250,000 = 1,310,000$ Value before contribution = 1,060,000.
Return factor for Period 1: $1 + j_1 = \frac{1{,}060{,}000}{1{,}000{,}000} = 1.06$

Period 2: Jul 1, 2005 to Dec 31, 2005
Starting value (after contribution): 1,310,000
Benefits paid at end: 150,000
Value just before benefits is unknown, but value after benefits on Jan 1, 2006 is 1,265,000.
So: Value before benefits $- 150,000 = 1,265,000$ Value before benefits = 1,415,000.
Return factor for Period 2: $1 + j_2 = \frac{1,415,000}{1,310,000} \approx 1.080152$

Period 3: Jan 1, 2006 to Jun 30, 2006
Starting value: 1,265,000
Contribution at end: +250,000
Value before contribution + 250,000 = Value on Jul 1, 2006 = 1,540,000
So Value before contribution = 1,290,000.
Return factor for Period 3: $1 + j_3 = \frac{1,290,000}{1,265,000} \approx 1.019763$

Period 4: Jul 1, 2006 to Dec 31, 2006
Starting value (after contribution): 1,540,000
Benefits paid at end: 150,000
Value before benefits - 150,000 = Value on Jan 1, 2007 = 1,420,000
So Value before benefits = 1,570,000.
Return factor for Period 4: $1 + j_4 = \frac{1,570,000}{1,540,000} \approx 1.019481$

Overall time-weighted return factor for 2 years:

$$(1 + i_{\text{tw}})^2 = (1.06) \times (1.080152) \times (1.019763) \times (1.019481)$$

Calculate step by step:

$$1.06 \times 1.080152 = 1.144961$$
$$1.144961 \times 1.019763 = 1.167308$$
$$1.167308 \times 1.019481 = 1.190000$$

So:

$$(1 + i_{\text{tw}})^2 = 1.190000$$
$$1 + i_{\text{tw}} = \sqrt{1.190000} = 1.090872$$
$$i_{\text{tw}} = 0.090872 \approx 9.1\%$$

The effective annual time-weighted rate of return is approximately 9.1%.
Answer: **B. 9.1%**

Solution to Question 7: (source: SOA #132)
Let i be the annual effective interest rate.

The interest portion of the 11th payment: $I_{11} = i \times OB_{10}$
The interest portion of the 21st payment: $I_{21} = i \times OB_{20}$

Outstanding balance after 10 payments (OB_{10}) equals present value of remaining payments:

$$OB_{10} = 1200 a_{\overline{10}|i} + 900 v^{10} a_{\overline{10}|i} = a_{\overline{10}|i}(1200 + 900 v^{10})$$

After 20 payments:

$$OB_{20} = 900a_{\overline{10}|i}$$

Given: $I_{11} = 2I_{21}$ $i \times OB_{10} = 2 \times i \times OB_{20}$ $OB_{10} = 2OB_{20}$

So:

$$a_{\overline{10}|i}(1200 + 900v^{10}) = 2 \times 900a_{\overline{10}|i}$$

Cancel $a_{\overline{10}|i} > 0$:

$$1200 + 900v^{10} = 1800$$

$$900v^{10} = 600$$

$$v^{10} = \frac{600}{900} = \frac{2}{3}$$

Now find $I_{21} = i \times OB_{20} = i \times 900a_{\overline{10}|i}$:

$$a_{\overline{10}|i} = \frac{1 - v^{10}}{i} = \frac{1 - \frac{2}{3}}{i} = \frac{\frac{1}{3}}{i}$$

Thus:

$$I_{21} = i \times 900 \times \frac{1/3}{i} = 900 \times \frac{1}{3} = 300$$

The interest portion of the 21st payment is 300.
Answer: **C. 300**

Solution to Question 8: (source: SOA #139)
Given:

- Face value = 3000, redemption value = 2800 (at maturity)
- Annual coupon rate = 10%, payable semiannually semiannual coupon = $3000 \times 0.10 \times \frac{1}{2} = 150$
- Original purchase assumed: Called at end of 4 years for 2900, with annual effective yield = 10%

Step 1: Find the purchase price P.

With annual effective yield = 10%, semiannual yield rate j satisfies:

$$1 + j = (1.10)^{1/2} = 1.0488088 \Rightarrow j \approx 0.0488088$$

If called at end of 4 years (8 semiannual periods):

$$P = 150a_{\overline{8}|j} + 2900(1 + j)^{-8}$$

$$a_{\overline{8}|0.0488088} = \frac{1 - 1.0488088^{-8}}{0.0488088} \approx 6.4947$$

$$(1.0488088)^{-8} \approx 0.6830$$

$$P \approx 150 \times 6.4947 + 2900 \times 0.6830 \approx 974.205 + 1980.70 \approx 2954.91$$

Step 2: Bond is called immediately after first coupon payment for 2960.

Time line: Purchase at price $P \approx 2954.91$.
After 0.5 years: Receive first coupon of 150, then bond is called for 2960.
Total received at time 0.5 years = 150 + 2960 = 3110.

Let j be the semiannual yield rate for this investment. Then:

$$P = 3110(1+j)^{-1}$$

$$2954.91 = \frac{3110}{1+j}$$

$$1 + j = \frac{3110}{2954.91} \approx 1.05242$$

$$j \approx 0.05242$$

Annual effective yield rate i:

$$i = (1+j)^2 - 1 = (1.05242)^2 - 1 \approx 1.10759 - 1 = 0.10759 \approx 10.8\%$$

Answer: **C. 10.8%**

Solution to Question 9: (source: SOA #163)
Let r be the coupon rate for Bond A. Then Bond B's coupon rate is $r + 0.01$.

Price of Bond A: $P_A = 1000\left[v^{20} + ra_{\overline{20}|0.10}\right]$
Price of Bond B: $P_B = 1000\left[v^{20} + (r+0.01)a_{\overline{20}|0.10}\right]$
where $v = (1.10)^{-1} = 0.9090909$, $v^{20} = (1.10)^{-20} \approx 0.1486436$
and $a_{\overline{20}|0.10} = \frac{1-v^{20}}{0.10} \approx \frac{1-0.1486436}{0.10} = 8.513564$.

Total price: $P_A + P_B = 1600$:

$$1600 = 1000\left[2v^{20} + 2ra_{\overline{20}|0.10} + 0.01a_{\overline{20}|0.10}\right]$$

Divide by 1000:

$$1.6 = 2v^{20} + 2ra_{\overline{20}|0.10} + 0.01a_{\overline{20}|0.10}$$

Substitute values:

$$1.6 = 2(0.1486436) + 2r(8.513564) + 0.01(8.513564)$$

$$1.6 = 0.2972872 + 17.027128r + 0.08513564$$

$$1.6 = 0.38242284 + 17.027128r$$

$$17.027128r = 1.6 - 0.38242284 = 1.21757716$$

$$r = \frac{1.21757716}{17.027128} \approx 0.0715 = 7.15\%$$

Answer: **B. 7.15%**

Solution to Question 10: (source: Ass 3, Chapter 4 - Callable Bonds)
For a premium bond (P >F), the coupon rate >market yield. The issuer will likely call the bond early to stop overpaying coupons. The worst case for the investor (minimum yield) occurs if the bond is called at the earliest call date, as they receive the call price sooner and lose future high coupon payments.
Answer: **B. The minimum yield for the investor occurs if the bond is called at the earliest call date**

Solution to Question 11: (source: Ass 3, Chapter 4 - Callable Bonds)
For a discount bond (P <F), the coupon rate <market yield. The issuer has no incentive to call early since they're paying below-market coupons. The worst case for the investor (minimum yield) occurs if the bond is held to maturity, as they're locked into below-market coupons for the full term.
Answer: **C. The minimum yield for the investor occurs if the bond is held to maturity**

Solution to Question 12: (source: Ass 3, Chapter 4 - Callable Bonds)
Yield to worst is the minimum yield among all possible call dates and maturity. It represents the worst-case scenario for the investor given the call provisions.
Answer: **C. Both yield to maturity and yield to all possible call dates, taking the minimum**

Solution to Question 13: (source: Ass 3, Chapter 4 - Callable Bonds)
When market rates drop below the coupon rate, the bond price increases (since it pays above-market coupons). The bond will sell at a premium. The issuer has an incentive to call the bond to refinance at the new lower rates.
Answer: **C. The bond price will increase and the issuer will call the bond**

Solution to Question 14: (source: Chapter 3 - Loan Repayment)
In an amortized loan with level payments, the interest portion decreases over time (as the outstanding balance decreases) while the principal portion increases.
Answer: **B. The interest portion decreases over time while the principal portion increases**

Solution to Question 15: (source: Chapter 3 - Loan Repayment)
In the sinking fund method, the borrower pays interest each period to the lender and makes deposits to a separate sinking fund that accumulates to repay the principal at maturity.
Answer: **D. The borrower pays interest to the lender and makes deposits to a**

separate fund that accumulates to the loan principal

Solution to Question 16: (source: Chapter 3 - Loan Repayment)
The outstanding balance after a payment can be calculated as: (1) Retrospectively: Original loan minus accumulated principal paid, or (2) Prospectively: Present value of remaining payments. Both methods yield the same result.
Answer: **E. Both A and B are correct**

Solution to Question 17: (source: Chapter 5 - Investment Return Measurement)
Net Present Value (NPV) is defined as the present value of cash inflows minus the present value of cash outflows. A positive NPV indicates a profitable investment.
Answer: **A. The difference between the present value of cash inflows and present value of cash outflows**

Solution to Question 18: (source: Chapter 5 - Investment Return Measurement)
Dollar-weighted return (internal rate of return) is affected by the timing and magnitude of cash flows, as it solves for the rate that equates present values. Time-weighted return eliminates the effect of cash flow timing by calculating returns between cash flows and linking them geometrically.
Answer: **A. Dollar-weighted return is affected by the timing of cash flows, while time-weighted return is not**