

Data for Question 5

Data for two funds:

	<u>Fund A</u>	<u>Fund B</u>
Interest/discount rate for first 10 years	$i^{(4)} = 6\%$	$d^{(12)} = 9\%$
Discount/interest rate for second 10 years	$d^{(4)} = 9\%$	$i^{(12)} = 12\%$
Initial amount in fund	\$W	\$X
Amount in fund at end of 20 years	\$Y	\$Z

There are no contributions to or withdrawals from either fund.

$$\$W + \$X = \$10,000$$

$$\$Y + \$Z = \$57,186$$

Question 5

In what range is \$Y?

- [A] Less than \$27,500
- [B] \$27,500 but less than \$28,400
- [C] \$28,400 but less than \$29,300
- [D] \$29,300 but less than \$30,200
- [E] \$30,200 or more

2004

Data for Question 2 (4 points)

On 1/1/2004, Smith purchases an annuity certain that has three semi-annual payments of \$500 each, with the first payment to be made 7/1/2009. The force of interest at time t is given by:

$$\delta_t = \frac{1}{(50+2t)} \quad \text{where } t \geq 0; t \text{ is measured in years from 1/1/2004}$$

Question 2

In what range is the present value of the annuity on 1/1/2004?

- (A) Less than \$1,350
- (B) \$1,350 but less than \$1,355
- (C) \$1,355 but less than \$1,360
- (D) \$1,360 but less than \$1,365
- (E) \$1,365 or more

2005

Data for Question 11 (3 points)

Data for a participant in a defined contribution plan:

Age at 1/1/2005:	40
2005 salary:	\$50,000
Investment returns:	5%, compounded annually.
Salary increases:	4% annual increases over the salary in the prior year.
Contributions:	6% of annual salary at the end of each year.
Balance at 1/1/2005:	\$0

X is the account balance as of 1/1/2030.

Question 11

In what range is X?

- (A) Less than \$192,000
- (B) \$192,000 but less than \$201,600
- (C) \$201,600 but less than \$211,200
- (D) \$211,200 but less than \$220,800
- (E) \$220,800 or more

Data for Question 21 (2 points)

Given the following spot rates from a yield curve:

<u>Duration</u>	<u>Annual yield</u>
1 year	2.00%
2 years	4.00%
3 years	5.00%

A three-year bond with annual coupons of X is purchased at par value for \$5,000.

Question 21

In what range is X?

- (A) Less than \$243
- (B) \$243 but less than \$245
- (C) \$245 but less than \$247
- (D) \$247 but less than \$249
- (E) \$249 or more

Data for Question 22 (2 points)

Given the following spot rates from a yield curve:

<u>Duration</u>	<u>Annual yield</u>
1 year	2.00%
2 years	4.00%
3 years	5.00%

Future forward rates are based on current spot rates.

X = the one-year forward rate implied by the yield curve at the end of the second year.

Question 22

In what range is X?

- (A) Less than 3.50%
- (B) 3.50% but less than 5.00%
- (C) 5.00% but less than 6.50%
- (D) 6.50% but less than 8.00%
- (E) 8.00% or more

Data for Question 11 (2 points)

$$\frac{i^{(12)}}{d^{(12)}} = 1.01$$

Question 11

In what range is the annual rate of interest compounded annually?

- (A) Less than 12.2%
- (B) 12.2% but less than 12.4%
- (C) 12.4% but less than 12.6%
- (D) 12.6% but less than 12.8%
- (E) 12.8% or more

Data for Question 19 (2 points)

A bond has the following payment structure:

- 1) \$1,000 payable in one year;
- 2) \$1,000 payable in two years;
- 3) 10% yield to maturity.

The 2-year spot rate on the yield curve is 8% when the bond is issued.

Question 19

In what range is the one-year spot rate?

- (A) Less than 12.5%
- (B) 12.5% but less than 13.0%
- (C) 13.0% but less than 13.5%
- (D) 13.5% but less than 14.0%
- (E) 14.0% or more

2008

Data for Question 2 (2 points)

A bond has the following payment structure:

\$1,000 payable in one year and \$1,000 payable in two years

Interest rate: 10.00%, compounded annually

Two-year spot rate: 8.00%, compounded annually

Question 2

In what range is the one-year spot rate?

- (A) Less than 13.65%
- (B) 13.65% but less than 13.75%
- (C) 13.75% but less than 13.85%
- (D) 13.85% but less than 13.95%
- (E) 13.95% or more

Data for Question 5 (3 points)

\$3,000 is invested in a fund at a constant force of interest of δ . At time n , \$2,000 is taken out and the balance accumulates for a further n years at the same force of interest. At time $2n$, the fund is \$225,000.

X = value of fund at time $2n$ if the force of interest were halved.

Question 5

In what range is X ?

- (A) Less than \$22,000
- (B) \$22,000 but less than \$32,000
- (C) \$32,000 but less than \$42,000
- (D) \$42,000 but less than \$52,000
- (E) \$52,000 or more

2009

Data for Question 7 (3 points)

Employee Smith earns an annual salary in 2009 of \$50,000.

Assumed salary increases: 3% each year, beginning 1/1/2010.

At the end of each year, beginning 12/31/2009, 5% of Smith's annual salary is deposited into a fund earning an annual rate of interest of 6%.

X = the amount in Smith's fund on 1/1/2030.

Question 7

In what range is X ?

- (A) Less than \$122,000
- (B) \$122,000 but less than \$126,000
- (C) \$126,000 but less than \$130,000
- (D) \$130,000 but less than \$134,000
- (E) \$134,000 or more

2009

Data for Question 27 (2 points)

On 1/1/2009, Smith purchases a 5-year Certificate of Deposit that yields:

6% interest per year, compounded monthly for years 1 and 2

7% interest per year, compounded quarterly for year 3

8% interest per year, compounded semiannually for years 4 and 5

X = the equivalent annual rate of interest compounded annually.

Question 27

In what range is X ?

- (A) Less than 6.700%
- (B) 6.700% but less than 6.900%
- (C) 6.900% but less than 7.100%
- (D) 7.100% but less than 7.300%
- (E) 7.300% or more

Data for Question 28 (2 points)

$$v^{11} = 1/2$$

$$X = 100|i^{(4)} - d^{(4)}|$$

Question 28

In what range is X ?

- (A) Less than 0.07
- (B) 0.07 but less than 0.14
- (C) 0.14 but less than 0.21
- (D) 0.21 but less than 0.28
- (E) 0.28 or more

2010

Data for Question 1 (3 points)

Fund balance as of 1/1/2010: \$12,000.

Deposits to the fund: 60 deposits of \$100 on the last day of each month with the first deposit made on 1/31/2010.

Withdrawals from the fund: 20 withdrawals of \$1,000 on the first day of each quarter beginning 1/1/2017.

Interest rate: 8.0% per year, compounded monthly.

X = the fund balance as of 12/31/2021.

Question 1

In what range is X ?

- (A) Less than \$13,500
- (B) \$13,500 but less than \$15,000
- (C) \$15,000 but less than \$16,500
- (D) \$16,500 but less than \$18,000
- (E) \$18,000 or more

2010

Data for Question 22 (2 points)

The term structure of interest rates is given by the following annual spot rates:

<u>Length of Investment</u>	<u>Spot Rate</u>
1 year	6.0%
2 years	6.5%
3 years	6.8%
4 years	7.0%

X = the present value of payments of \$1,000 at the end of each of the next 4 years.

Question 22

In what range is X ?

- (A) Less than \$3,425
- (B) \$3,425 but less than \$3,450
- (C) \$3,450 but less than \$3,475
- (D) \$3,475 but less than \$3,500
- (E) \$3,500 or more

2010

Data for Question 23 (3 points)

You are given the following for Smith:

Annual salary as of 1/1/2010: \$40,000

Assumed salary increases: 4.0% each year, beginning 1/1/2011

At the end of each month, beginning 1/31/2010, Smith deposits 7.5% of his monthly salary into a fund earning an annual rate of interest of 5.0%.

X = the amount in Smith's fund on 12/31/2039.

Question 23

In what range is X ?

- (A) Less than \$285,000
- (B) \$285,000 but less than \$305,000
- (C) \$305,000 but less than \$325,000
- (D) \$325,000 but less than \$345,000
- (E) \$345,000 or more

Data for Question 27 (2 points)

Smith pays \$950 for an investment that returns \$500 at the end of year 3, and \$700 at the end of year 4.

The purchase price is based on a 2-year spot rate of 5.0% and a 4-year spot rate of 7.0%.

Question 27

In what range is the year 3 forward rate?

- (A) Less than 7.0%
- (B) 7.0% but less than 7.6%
- (C) 7.6% but less than 8.2%
- (D) 8.2% but less than 8.8%
- (E) 8.8% or more

2010

Data for Question 31 (4 points)

A pension plan provides a single sum benefit of 250% of final pay at retirement.

Smith's annual rate of pay on 12/31/2009 was \$50,000.

Assumptions:

Smith will retire on 12/31/2019.

Salary increases are given on January 1 of each year at the annual inflation rate.

Interest rate equals the annual inflation rate plus the real return rate.

Real return rate: 4.0% per year, compounded annually.

There are no decrements prior to retirement.

X = absolute value of the change in the present value of the benefit as of 1/1/2010 if the assumed annual inflation rate were increased from 3.0% to 5.0%.

Question 31

In what range is X ?

- (A) Less than \$300
- (B) \$300 but less than \$600
- (C) \$600 but less than \$900
- (D) \$900 but less than \$1,200
- (E) \$1,200 or more

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