ACTEX Learning

EA-1 Exams & Solutions

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An EA Exam

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CONDITIONS GENERALLY APPLICABLE TO ALL EA-1 EXAMINATION QUESTIONS

If applicable, the following conditions should be considered a part of the data for each question, unless otherwise stated or implied.

(1) The normal retirement age is 65.

(2) Retirement pensions commence at normal retirement age and are paid monthly for life at the beginning of each month.

(3) There are no pre-retirement death or disability benefits.

(4) Actuarial equivalence is based on the mortality table and interest rate assumed for funding purposes.

(5) Interest rates that are compounded more frequently than annually are expressed as nominal rates.

(6) Where multiple lives are involved, future lifetimes are assumed to be independent of each other.

(7) The term "gross single premium" is equivalent to "contract single premium;" the term "net single premium" is equivalent to "single benefit premium;" the term "gross annual premium" is equivalent to "annual contract premium;" the term "net annual premium" is equivalent to "annual benefit premium."

(8) There are no policy loans in effect.

(9) For a bond, the face amount and the redemption value are the same.

(10) Interest rate equals yield rate.

(11) The term "duration" means "Macaulay duration".

If applicable, the preceding conditions should be considered a part of the data for each question, unless otherwise stated or implied.

Data for Question 1 (2 points)

$5,000 will accumulate to $7,000 at a rate of simple interest i over a period t.

$\boldsymbol{X}$= the accumulated value of $750 at a rate of simple interest $0.75i$ over period $2t$.

Question 1

In what range is $\boldsymbol{X}$?

(A) Less than $1,110

(B) $1,110 but less than $1,160

(C) $1,160 but less than $1,210

(D) $1,210 but less than $1,260

(E) $1,260 or more

Data for Question 2 (3 points)

A 5-year certificate of deposit yields the following:

6.0% per year, compounded monthly for years 1 and 2

6.8% per year, compounded quarterly for year 3

7.6% per year, compounded semiannually for years 4 and 5

X= the effective annual interest rate earned over the 5-year period.

Question 2

In what range is ***X***?

(A) Less than 6.80%

(B) 6.80% but less than 6.90%

(C) 6.90% but less than 7.00%

(D) 7.00% but less than 7.10%

(E) 7.10% or more

Data for Question 3 (2 points)

Smith invests $1,000 that accrues interest monthly.

$d^{(2)}=0.06$

$\boldsymbol{X}$= the accumulated value of Smith's investment after one year.

Question 3

In what range is $\boldsymbol{X}$?

(A) Less than $1,060

(B) $1,060 but less than $1,062

(C) $1,062 but less than $1,064

(D) $1,064 but less than $1,066

(E) $1,066 or more

Data for Question 4 (4 points)

$\ddot{a}_{\overline{n+1}|} = 8.36009$

$v^n = 0.55839$

Question 4

In what range is $(Ia)_{\overline{2n}|}$?

(A) Less than 100

(B) 100 but less than 130

(C) 130 but less than 160

(D) 160 but less than 190

(E) 190 or more

Data for Question 5 (3 points)

Smith purchases a 20-year immediate annuity-certain and pays for it with a single premium.

The terms of the annuity follow:

In each of the first 10 years, $50,000 is paid in equal monthly installments.

In each of the next 10 years, $25,000 is paid in equal quarterly installments.

Interest rate: 4.00% per year, compounded semiannually.

X = the single premium paid by Smith.

Question 5

In what range is X?

(A) Less than $525,000

(B) $525,000 but less than $535,000

(C) $535,000 but less than $545,000

(D) $545,000 but less than $555,000

(E) $555,000 or more

Data for Question 6 (3 points)

Smith borrows $100,000 and will repay it with level payments at the end of each month.

The lender offers Smith two options for the repayment:

	Option 1	Option 2
Interest rate:	Nominal 6.00% per year, compounded monthly	Nominal 4.00% per year, compounded monthly
Term:	30 years	15 years

X = the absolute value of the difference in the amount of interest Smith will pay over the life of the loan between Option 1 and Option 2

Question 6

In what range is ***X***?

(A) Less than $60,500

(B) $60,500 but less than $70,500

(C) $70,500 but less than $80,500

(D) $80,500 but less than $90,500

(E) $90,500 or more

Data for Question 7 (3 points)

Terms of a loan:

Amount of loan:	X
Repayment period:	20 years
Payments:	Level annual payments at the end of each year

Interest portion of the 11^{th} payment: \$172.01

Interest portion of the 16^{th} payment: \$92.35

Question 7

In what range is X?

(A) Less than \$9,950

(B) \$9,950 but less than \$10,150

(C) \$10,150 but less than \$10,350

(D) \$10,350 but less than \$10,550

(E) \$10,550 or more

Data for Question 8 (3 points)

Terms of a bond:

Face amount:	$1,000
Term:	5 years
Coupon rate:	4.00%, payable semiannually

The bond is purchased to yield 6.00% per year, compounded annually.

X= the total amount for accumulation of discount during the third year of the bond.

Question 8

In what range is ***X***?

(A) Less than $16.13

(B) $16.13 but less than $16.33

(C) $16.33 but less than $16.53

(D) $16.53 but less than $16.73

(E) $16.73 or more

Data for Question 9 (3 points)

Selected data for two bonds that have the same annual yield to maturity:

	Bond A	Bond B
Par value	\$1,000	\$1,000
Coupon rate	5.00%, payable annually	10.42%, payable annually
Term to maturity	10 years	15 years
Price	A discount of \$166.66	A premium of X

Question 9

In what range is X?

(A) Less than \$155

(B) \$155 but less than \$190

(C) \$190 but less than \$225

(D) \$225 but less than \$260

(E) \$260 or more

Data for Question 10 (2 points)

The term structure of interest rates is given below:

Length of investment (years)	Spot rate
1	3.00%
2	4.00%
3	***X***

The 2-year deferred, 1-year spot rate implied by the current spot rates is 5.51%.

Question 10

In what range is ***X***?

(A) Less than 5.00%

(B) 5.00% but less than 6.25%

(C) 6.25% but less than 7.50%

(D) 7.50% but less than 8.75%

(E) 8.75% or more

Data for Question 11 (2 points)

Term structure of interest rates:

Term (years)	Spot rate
1	5.00%
2	5.75%
3	6.25%
4	6.65%

A $1,000 three-year bond is redeemable at par and pays annual 4.0% coupons.

X = the price of the bond.

Question 11

In what range is X?

(A) Less than $950

(B) $950 but less than $975

(C) $975 but less than $1,000

(D) $1,000 but less than $1,025

(E) $1,025 or more

Data for Question 12 (3 points)

A portfolio of assets consists of two investments:

1. A $1,000 par value bond with a coupon of $75 payable each 12/31 and a term of 3 years. This bond is redeemable at par.

2. A $1,000 zero coupon bond with a term of 10 years.

The interest rate is 6.0% per year, compounded annually.

X= the modified duration of this portfolio.

Question 12

In what range is ***X***?

(A) Less than 4.85 years

(B) 4.85 years but fewer than 4.94 years

(C) 4.94 years but fewer than 5.03 years

(D) 5.03 years but fewer than 5.12 years

(E) 5.12 years or more