

**November 2001
Society of Actuaries**

**COURSE 5
MORNING SESSION**

APPLICATION OF BASIC ACTUARIAL PRINCIPLES

SECTION A-WRITTEN ANSWER

****BEGINNING OF EXAMINATION 5****
MORNING SESSION

- 1.** (5 points) With respect to participating life insurance products,

 - (a) Explain the rationale for offering participating products.
 - (b) Describe the considerations in setting policyholder dividends.
 - (c) Describe the concerns regulators have with policyholder dividends.

- 2.** (6 points) Describe the rating variables that should be considered when developing group insurance medical claim costs.

- 3.** (6 points) Describe each of the following provisions which can be included in an individual disability income contract:

 - (a) Residual Disability Income Benefit;
 - (b) Guaranteed Insurability Option Benefit; and
 - (c) Cost Of Living Benefit.

4. (5 points) You are given the following retirement plan information for an individual:

Current Age	40
Entry Age	30
Retirement Age	65
Social Security Benefit	\$11,700
Current Salary	\$80,000
Annual Salary Growth	3%
Personal Savings Accumulation Rate	7%
Final Salary (at age 64)	\$162,624
Retirement Benefit	1% of final 5-year average salary times years of service
Annuity Conversion Factor @ age 65	8.1958

The individual begins saving for retirement at his current age.

Calculate the level percent of salary that should be allocated to personal savings each year to provide this individual with a 70% full replacement ratio. Show all work.

5. (8 points) Describe the following reserve methods for life insurance products:

- (a) simplified net premium method;
- (b) realistic net premium method;
- (c) gross premium method; and
- (d) accumulation method.

6. (5 points) You are given the following information for a defined benefit plan:

Plan Effective Date: 01/01/2001

Plan Year = Calendar Year

Normal Retirement Benefit: 2% of final three-year average pay for each year of service

Actuarial Cost Method: Entry Age Normal

Actuarial Assumptions:

Interest:	8.00%
Salary Scale:	5.00%
Preretirement termination other than death:	None

Data for the 10 active participants as of 1/1/2001 (there are no inactive participants):

Age:	45
Past Service:	5 years
2001 Salary:	\$25,000
Plan Assets at 1/1/2001:	0

Selected annuity values:

$$\ddot{a}_{65}^{(12)} = 10$$

$$\ddot{a}_{10} = 7$$

Selected Commutation Functions:

X	D_X	$N_X - N_{65}$	S_X	${}^S N_X - {}^S N_{65}$
40	245	3200	1.0000	7100
45	180	2100	1.2763	5000
65	50	0	3.3864	0

The supplemental liability is amortized over 10 years.

Determine the annual cost as of December 31, 2001 for the 2001 plan year based on an initial valuation as of January 1, 2001.

Show all work.

7. (5 points) Describe key issues that should be addressed by an insurance company to establish the need for a new group insurance product.

****END OF WRITTEN ANSWER SECTION****

**COURSE 5
MORNING SESSION**

APPLICATION OF BASIC ACTUARIAL PRINCIPLES

SECTION B-MULTIPLE CHOICE

MULTIPLE CHOICE SECTION

Each of questions 1 through 2 consists of an assertion in the left-hand column and a reason in the right-hand column. Code your answer to each question by blackening space:

- (A) If both the assertion and the reason are true statements, and the reason is a correct explanation of the assertion.
- (B) If both the assertion and the reason are true statements, but the reason is NOT a correct explanation of the assertion.
- (C) If the assertion is a true statement, but the reason is a false statement.
- (D) If the assertion is a false statement, but the reason is a true statement.
- (E) If both the assertion and the reason are false statements.

ASSERTION

REASON

- 1.** With respect to a large group health plan, net premiums can be a larger percentage of gross premiums than is the case for equivalent individual health insurance.

BECAUSE

State regulation does not impact large group health insurance pricing as heavily as it does individual health insurance pricing.

ASSERTION

REASON

- 2.** In Canada, it is expected that cost-sharing mechanisms will become more attractive to provincial health care plans.

BECAUSE

In Canada, provincial health plans with cost-sharing mechanisms will only be penalized to the amount of the federal health transfer they would otherwise receive.

Each of questions 3 through 6 consists of two lists. In the list at the left are two items, lettered X and Y. In the list at the right are three items, numbered I, II, and III. ONE of the lettered items is related in some way to EXACTLY TWO of the numbered items. Indicate the related items using the following answer code:

	<u>Lettered Item</u>	<u>Is Related to Numbered Items</u>
(A)	X	I and II only
(B)	X	II and III only
(C)	Y	I and II only
(D)	Y	I and III only
(E)	The correct answer is not given by (A), (B), (C) or (D).	

- 3.**
- | | | | |
|----|---|------|---|
| X. | Group Term Life Insurance in the U.S. | I. | Can result in imputed taxable income |
| Y. | Group Accidental Death and Dismemberment Insurance (AD&D) in the U.S. | II. | Optional amounts are available without medical evidence |
| | | III. | Usually convertible to individual coverage |

- 4.**
- | | | | |
|----|---|------|--|
| X. | Short Term Disability (STD) in the U.S. | I. | Benefits are integrated with Social Security benefits |
| Y. | Long Term Disability (LTD) in the U.S. | II. | Benefits are paid weekly |
| | | III. | Benefit amount may be reduced to coordinate with state disability insurance (SDI) programs |

- 5.** X. Medicaid
- Y. Medicare
- I. The beneficiaries pay fixed fees for specified services
- II. The program pays a percentage of allowable charges
- III. No deductible

- 6.** X. Indemnity plan cancer policy
- Y. Scheduled plan cancer policy
- I. Specified benefits for each of the various types of expenses
- II. Paid regardless of the actual hospital charges
- III. Often no dollar limit on total benefits

7. Rank in ascending order (shortest to longest) the elimination periods usually found in the following types of individual health insurance policies:

- I. Overhead expense benefits
- II. Disability buy-out benefits
- III. Presumptive disability benefits

- (A) I < II < III
- (B) I < III < II
- (C) II < III < I
- (D) III < I < II
- (E) III < II < I

Each of questions 8 through 9 consists of an assertion in the left-hand column and a reason in the right-hand column. Code your answer to each question by blackening space:

- (A) If both the assertion and the reason are true statements, and the reason is a correct explanation of the assertion.
- (B) If both the assertion and the reason are true statements, but the reason is NOT a correct explanation of the assertion.
- (C) If the assertion is a true statement, but the reason is a false statement.
- (D) If the assertion is a false statement, but the reason is a true statement.
- (E) If both the assertion and the reason are false statements.

ASSERTION

REASON

8.

The use of a coinsurance clause in a homeowners insurance policy results in premiums that are inequitable among insureds.

BECAUSE

In a homeowners insurance policy with a coinsurance clause, persons who purchase small amounts of insurance would bring a disproportionate amount of risk to the pool if losses were skewed to smaller claims.

ASSERTION

REASON

9.

A cash balance plan is a defined contribution pension plan.

BECAUSE

In a cash balance plan, the benefit is expressed in terms of an account balance.

Each of questions 10 through 11 consists of two lists. In the list at the left are two items, lettered X and Y. In the list at the right are three items, numbered I, II, and III. ONE of the lettered items is related in some way to EXACTLY TWO of the numbered items. Indicate the related items using the following answer code:

	<u>Lettered Item</u>	<u>Is Related to Numbered Items</u>
(A)	X	I and II only
(B)	X	II and III only
(C)	Y	I and II only
(D)	Y	I and III only
(E)	The correct answer is not given by (A), (B), (C) or (D).	

- 10.**
- | | | | |
|----|-----------------------------------|------|--|
| X. | Defined Contribution Pension Plan | I. | Usually favors employees hired at younger ages |
| Y. | Defined Benefit Pension Plan | II. | Contributions higher for female employees |
| | | III. | Employer assumes investment risk |

- 11.**
- | | | | |
|----|----------------------|------|--|
| X. | GAAP financials | I. | Match incidence of revenues and expenses |
| Y. | Statutory financials | II. | Value insurer on a going concern basis |
| | | III. | More conservative standards for liability valuations |

Each of questions 12 through 13 consists of an assertion in the left-hand column and a reason in the right-hand column. Code your answer to each question by blackening space:

- (A) If both the assertion and the reason are true statements, and the reason is a correct explanation of the assertion.
- (B) If both the assertion and the reason are true statements, but the reason is NOT a correct explanation of the assertion.
- (C) If the assertion is a true statement, but the reason is a false statement.
- (D) If the assertion is a false statement, but the reason is a true statement.
- (E) If both the assertion and the reason are false statements.

<u>ASSERTION</u>		<u>REASON</u>
12. Most life insurance companies adjust prices when they are out of line with the competition.	BECAUSE	Most buyers of life insurance shop around and compare prices.

<u>ASSERTION</u>		<u>REASON</u>
13. Skim pricing is rare for life insurance products.	BECAUSE	Skim pricing is usually done with products that are in short supply and high demand.

14. Rank in ascending order (smallest to largest) the following products according to how much investment risk is transferred to the policyholder:

- I. Universal life insurance
- II. Variable universal life insurance
- III. Term insurance

- (A) I < II < III
- (B) I < III < II
- (C) II < III < I
- (D) III < I < II
- (E) III < II < I

15. Rank in ascending order (smallest to largest) the premium level of the following life insurance policies.

- I. Participating Whole Life Insurance
- II. Level Term to 100 Insurance
- III. Non-participating Whole Life Insurance

- (A) I < II < III
- (B) I < III < II
- (C) II < III < I
- (D) III < I < II
- (E) III < II < I

16. Rank in ascending order (lowest to highest) the price level of a product resulting from the following strategies:

I. Opportunistic pricing

II. Adaptive pricing

III. Predatory pricing

(A) I < II < III

(B) I < III < II

(C) II < III < I

(D) III < I < II

(E) III < II < I

Each of questions 17 through 18 consists of two lists. In the list at the left are two items, lettered X and Y. In the list at the right are three items, numbered I, II, and III. ONE of the lettered items is related in some way to EXACTLY TWO of the numbered items. Indicate the related items using the following answer code:

	<u>Lettered Item</u>	<u>Is Related to Numbered Items</u>
(A)	X	I and II only
(B)	X	II and III only
(C)	Y	I and II only
(D)	Y	I and III only
(E)	The correct answer is not given by (A), (B), (C) or (D).	

- 17.**
- | | | | |
|----|---------------------|------|--|
| X. | Penetration pricing | I. | Different price levels for buyers with different behaviors |
| Y. | Segmented pricing | II. | Works best with commodity-like products |
| | | III. | Price set to generate high level of sales |

- 18.**
- | | | | |
|----|-----------------------|------|--|
| X. | Low lapse rates | I. | Cause an increase in the average mortality of the remaining group |
| Y. | Selective lapse rates | II. | Tend to decrease the percentage of unhealthy insureds |
| | | III. | Result in mortality at older ages that increase more slowly by policy year |

Each of questions 19 through 23 consists of an assertion in the left-hand column and a reason in the right-hand column. Code your answer to each question by blackening space:

- (A) If both the assertion and the reason are true statements, and the reason is a correct explanation of the assertion.
- (B) If both the assertion and the reason are true statements, but the reason is NOT a correct explanation of the assertion.
- (C) If the assertion is a true statement, but the reason is a false statement.
- (D) If the assertion is a false statement, but the reason is a true statement.
- (E) If both the assertion and the reason are false statements.

	<u>ASSERTION</u>		<u>REASON</u>
19.	In Canada, a variable life insurance product is taxed annually on the “inside buildup” of cash value.	BECAUSE	In Canada, a life insurer’s segregated fund is not treated as a trust for income tax purposes.

	<u>ASSERTION</u>		<u>REASON</u>
20.	The amount of depreciation taken for tax purposes usually exceeds depreciation taken for regular financial statements.	BECAUSE	Governments often use depreciation allowances to stimulate the general economy.

ASSERTION

- 21.** In life insurance, the trend has been towards fewer risk classifications

REASON

- BECAUSE** In life insurance, the increased cost of underwriting tests and requirements have not made it cost effective to create additional risk classifications.

ASSERTION

- 22.** In the U.S., large employers often use administration services only (ASO) arrangements for health plans.

REASON

- BECAUSE** In the U.S., ASO arrangements are exempt from the provisions of ERISA.

ASSERTION

- 23.** In the U.S., individual underwriting is used for small groups.

REASON

- BECAUSE** In the U.S., the use of individual underwriting for small groups allows the carrier to decline individuals who would pose an unacceptable health risk.

Each of questions 24 through 25 consists of two lists. In the list at the left are two items, lettered X and Y. In the list at the right are three items, numbered I, II, and III. ONE of the lettered items is related in some way to EXACTLY TWO of the numbered items. Indicate the related items using the following answer code:

	<u>Lettered Item</u>	<u>Is Related to Numbered Items</u>
(A)	X	I and II only
(B)	X	II and III only
(C)	Y	I and II only
(D)	Y	I and III only
(E)	The correct answer is not given by (A), (B), (C) or (D).	

- 24.**
- | | | | |
|----|---|------|--|
| X. | Balance Sheet treatment of policy loans. | I. | Policy loans shown as a reduction in liabilities. |
| Y. | Income Statement treatment of policy loans. | II. | Policy loans shown as an asset. |
| | | III. | Policy loan interest shown as a reduction in benefits. |

- 25.**
- | | | | |
|----|--------------------------------------|------|---|
| X. | The 1960 Basic Group Mortality Table | I. | Useful in estimating annual improvements in mortality |
| Y. | Population Statistics | II. | Principally used as a tabular base when comparisons of actual to expected experience are made |
| | | III. | Useful in developing rates for the very young and very old |

26. Rank in ascending order (smallest to largest), the assumed mortality rate in the year of annuitization for the following, using typical mortality tables for a given person:

- I. Individual annuitant
- II. Group annuitant
- III. Structured settlement annuitant

- (A) I < II < III
- (B) I < III < II
- (C) II < III < I
- (D) III < I < II
- (E) III < II < I

Each of questions 27 through 35 consists of an assertion in the left-hand column and a reason in the right-hand column. Code your answer to each question by blackening space:

- (A) If both the assertion and the reason are true statements, and the reason is a correct explanation of the assertion.
- (B) If both the assertion and the reason are true statements, but the reason is NOT a correct explanation of the assertion.
- (C) If the assertion is a true statement, but the reason is a false statement.
- (D) If the assertion is a false statement, but the reason is a true statement.
- (E) If both the assertion and the reason are false statements.

	<u>ASSERTION</u>		<u>REASON</u>
27.	Nonexistent returns on investment are common when profits are based upon stockholder earnings.	BECAUSE	Required capital has no bearing on stockholder earnings except for investment income earned on the assets backing required capital.

	<u>ASSERTION</u>		<u>REASON</u>
28.	Under most group life insurance policies, if the group coverage terminates, insureds can convert to an individual life insurance policy only if they provide evidence of insurability.	BECAUSE	Any additional claim costs resulting from a conversion from a group life insurance policy to an individual life insurance policy are usually reflected in the standard rates for the individual policy.

ASSERTION

- 29.** Given an individual with five years of service, the entry-age normal cost method will produce a smaller initial actuarial liability than the traditional accrued benefit cost method.

REASON

BECAUSE Under the entry-age normal cost method, the use of average entry ages will produce a supplemental liability for individuals entering the plan after its establishment at ages above the assumed entry age.

ASSERTION

- 30.** In valuing a defined benefit pension plan, if benefits are related to compensation, the allowance for inflation is typically ignored.

REASON

BECAUSE In valuing a defined benefit pension plan, the inflation assumption used in the interest assumption is offset by the inflation assumption used in the salary scale.

ASSERTION

- 31.** Disability buy-out insurance is made available where a formal buy/sell agreement is not in place.

REASON

BECAUSE Buy/sell agreements cover only the contingency of death.

Each of questions 27 through 35 consists of an assertion in the left-hand column and a reason in the right-hand column. Code your answer to each question by blackening space:

- (A) If both the assertion and the reason are true statements, and the reason is a correct explanation of the assertion.
- (B) If both the assertion and the reason are true statements, but the reason is NOT a correct explanation of the assertion.
- (C) If the assertion is a true statement, but the reason is a false statement.
- (D) If the assertion is a false statement, but the reason is a true statement.
- (E) If both the assertion and the reason are false statements.

	<u>ASSERTION</u>		<u>REASON</u>
32.	A defined benefit cost method with relatively high future normal costs will have a low actuarial liability	BECAUSE	The present value of expected pension benefits varies by defined benefit cost method

	<u>ASSERTION</u>		<u>REASON</u>
33.	The amount of DAC tax is calculated as a percent of expense related to sales.	BECAUSE	The DAC tax is essentially a requirement that insurers delay the recognition of certain expenses when calculating current taxable income.

ASSERTION

- 34.** Policy reserves are generally less significant for group health insurance policies than for individual health insurance policies.

REASON

BECAUSE In many alternative funding methods for group health insurance policies, the policyholder participates in the insurance risk to some degree.

ASSERTION

- 35.** With respect to group medical costs, industries that have high turnover tend to have above average medical costs.

REASON

BECAUSE Groups that have the same demographic characteristics generally have similar medical costs.

Each of questions 36 through 40 consists of two lists. In the list at the left are two items, lettered X and Y. In the list at the right are three items, numbered I, II, and III. ONE of the lettered items is related in some way to EXACTLY TWO of the numbered items. Indicate the related items using the following answer code:

	<u>Lettered Item</u>	<u>Is Related to Numbered Items</u>
(A)	X	I and II only
(B)	X	II and III only
(C)	Y	I and II only
(D)	Y	I and III only
(E)	The correct answer is not given by (A), (B), (C) or (D).	

- 36.**
- | | | | |
|----|--|------|---------------------------------------|
| X. | Actuarial loss for retirement benefits | I. | Fewer participants die than expected |
| Y. | Actuarial gain for retirement benefits | II. | Fewer withdrawals than expected |
| | | III. | Slower salary increases than expected |

- 37.**
- | | | | |
|----|----------------------------|------|---|
| X. | Spread gain cost method | I. | Gains and losses affect the future normal costs |
| Y. | Immediate gain cost method | II. | Entry age normal cost method |
| | | III. | Gains and losses amortized by a supplemental cost |

- 38.** X. Factor method for determining claim reserves
- Y. Average size claim method for determining claim reserves
- I. Long payout periods
- II. Appropriate for group life insurance
- III. Incurred but not reported (IBNR) reserve needed
-
- 39.** X. Aggregate method of estimating medical claim costs
- Y. Benefit cost method of estimating medical claim costs
- I. Most useful where there are co-pays and limits which apply to a specific service
- II. Typically used for traditional indemnity type plans
- III. Estimated medical claim costs are determined from a claim probability distribution using an established database
-
- 40.** X. Variable accumulation annuities
- Y. Fixed accumulation annuities
- I. Generally backed by an insurance company's general portfolio
- II. Equity-indexed annuity
- III. Spread for pricing purposes is fixed

****END OF COURSE 5 EXAMINATION****

MORNING SESSION

**COURSE 5
AFTERNOON SESSION**

APPLICATION OF BASIC ACTUARIAL PRINCIPLES

SECTION C-WRITTEN ANSWER

****BEGINNING OF EXAMINATION 5****
AFTERNOON SESSION

- 8.** (5 points) Your company, Delta Life, is entering into a treaty with two reinsurers, Alpha Life and Beta Life. The treaty will cover a Term to Attained Age 95 product with level premiums for the first 20 years and annually increasing premiums thereafter.

You are given the following information:

Reinsurance Type	Automatic First Dollar Quota Share
Policy Face Amount	\$1,200,000
Current Year Reserve for Policy	\$ 100,000
Delta Life Retention Limit	\$ 500,000
Quota Share for Alpha Life	24%
Quota Share for Beta Life	36%

- (a) Describe the reasons a company may wish to reinsure its business.
- (b) Calculate the following:
- (i) the amount retained by Delta Life;
 - (ii) the amount ceded to Alpha Life; and
 - (iii) the amount ceded to Beta Life.

9. (6 points)

- (a) Describe the major considerations involved in underwriting large group life insurance plans.
- (b) Describe the major considerations involved in underwriting large group disability income plans.
- (c) Describe how past experience data is evaluated for group life insurance and group disability income plans.

10. (5 points) Describe how employee benefit plans are taxed in Canada and the U.S. for the following:

- (i) Medical expense insurance;
- (ii) Group term life insurance; and
- (iii) Disability income payments.

11. (7 points) Describe considerations in the determination of the pricing assumptions for:

- (a) Income annuities; and
- (b) Accumulation annuities.

12. (3 points) Explain the calculations for the normal cost and actuarial liability for the following cost methods:

- (i) Traditional accrued benefit; and
- (ii) Projected accrued benefit.

Define all terms.

- 13.** (9 points) You are given the following information for a Property and Casualty insurance company:

TERRITORY 1			
Risk class for Territory 1	Number of earned Exposure Units (number of lives)	Existing Rate	Expected losses
A (Base class)	50,000	\$40.00	\$1,100,000
B	30,000	50.00	1,200,000
C	20,000	75.00	400,000

TERRITORY 2			
Risk class for Territory 2	Number of earned Exposure Units (number of lives)	Existing Rate	Expected losses
A (Base class)	60,000	\$ 80.00	\$2,640,000
B	40,000	100.00	2,600,000
C	20,000	150.00	2,400,000

A rate change is proposed that will result in a permissible loss ratio of 60%.

- Calculate the new rates for each class in Territory 1 using the loss cost method, assuming the company operates in Territory 1 only.
- Calculate new rates using the loss ratio method for each class in Territory 1 and Territory 2 if Territory 2 is added and class differentials do not change. Assume the company operates in Territories 1 and 2. Use existing rates for Territory 1.

Show all work.

- 14.** (5 points) Describe required capital and the risks covered in the required capital calculation for a life insurance company.

****END OF COURSE 5 EXAMINATION****
AFTERNOON SESSION

Course 5
Nov. 2001
Preliminary Multiple Choice Key

<i>Question #</i>	<i>Answer</i>
1	B
2	E
3	E
4	B
5	E
6	C
7	A
8	E
9	D
10	E
11	E
12	C
13	A
14	D
15	C
16	D
17	B
18	B
19	C
20	B
21	E
22	C
23	C
24	A
25	D
26	A
27	B
28	E
29	D
30	E
31	E
32	C
33	D
34	B
35	C
36	A
37	E
38	D
39	B
40	C

NOVEMBER 2001

SOCIETY OF ACTUARIES

COURSE 5 SOLUTIONS

**November 2001
Society of Actuaries**

**COURSE 5
MORNING SESSION**

APPLICATION OF BASIC ACTUARIAL PRINCIPLES

SECTION A-WRITTEN ANSWER

SOLUTIONS

****BEGINNING OF EXAMINATION 5****
MORNING SESSION

Question 1

- (a)
- Charge higher premium than for non-par
 - Allows the premium to be guaranteed
 - Offset premium by paying dividends
 - Results in lower net cost of policyholder
 - Dividends allowing the sharing of good experience on the block of business, including favorable mortality, interest, lapse and tax experience
 - Necessary to compete in their selected market
- (b)
- Dividends are set using realistic assumptions
 - Desired competitive position
 - Ensure that agent and policyholder expectations are realistic in dividends illustrated
 - Set to achieve certain funding goals (high premium/high dividend, limited pay)
 - Reduce the likelihood that dividends may have to be reduced in the future – this can lead to a loss of confidence in the company
- (c)
- Concern that companies will pay insufficient dividends to policyholders
 - Concern that companies will pay more dividends than it can afford, thereby endangering solvency
 - Ensure equitable distribution of profit to shareholders and policyholders
 - Ensure equitable distribution of dividends among policyholders of different generations and classes, whose policies generated the profits
 - Ensure that any illustrations shown to prospective or current policyholders are reasonable

Question 2

Rating variables that should be considered include:

Age and Gender

Medical claim costs vary greatly among different age bands, and between males and females. Usually claim data are sorted according to age and gender. Age/gender studies are done every few years to develop age/gender factors. Sometimes age/gender factors are developed for different medical expense categories such as drugs or hospital. Also, age/gender factors may take into account the medical plan design such as deductible and coinsurance. Each method for determining exposure units is subject to different types of misestimating of claims costs.

Plan of Benefits

Claim costs are related to the plan itself. Factors such as coinsurance, deductible, maximum limits, tightness of exclusions, out of pocket benefits, and managed care features greatly affect claim costs. Cost-sharing stipulated by different plan designs greatly affects claim costs and must be taken into account. Different plan designs result in different utilization patterns. When plan has choices, employees choose the benefits that are most advantageous to them (= anti-selection).

Geographic Area

Costs of medical services supplied in different geographic areas vary considerably. Medical services in some areas/cities considered expensive compared to others. Thus, geographic area factors should be developed. These factors may also be developed for separate claim incurrals that vary by month of year. Also, it is important to make sure that claims belong to the intended exposure units during the study (1 year) duration.

Trend

The trend (usually an increase in claim costs with time) must be reflected because current claim costs will not be used in the current time, but in the future. Future medical expense costs may change from the current time for several reasons including changes in medical practices, use of new drugs, future technological developments, increases due to inflation. Thus, current claim costs need to be trended toward the future taking into consideration all factors that may affect costs.

Question 3

(a)

Residual Disability Income Benefit

- Also referred to as partial disability income benefit
- Residual disability is more common than total disability
- Residual disability is subjective and difficult to establish
- Encourages return to work or rehabilitation

- Typical Definition: Because of injury or illness,
 - 1A) Person unable to perform important duties of his/her occupation, but able to perform some of them
 - or B) Person is engaged in another occupation
 - 2) Person's monthly earnings after disability are more than 20% and less than 80% of earnings before disability
 - 3) Person is under the care of a physician

- Policies usually require a qualification period before allowing residual benefit
- May require period of total disability
- Qualification period may be 30, 60 or 90 days
- Some policies have zero-day qualification period
- Premium rate higher for shorter qualification period
- May limit benefit period if disability starts after age 60.
- Typical monthly benefit = $\text{Monthly Total Disability Benefit} \times (A-B)/A$
- Where A = Earnings before disability, B = Earnings for month in which benefits are being claimed (reduced earnings)

- May index prior earnings
- Combats effects of inflation
- May be sold in combination with cost-of-living benefit

(b)

Guaranteed Insurability Option

- Insured is given the chance to make periodic increases to monthly benefit as long as he/she is not disabled without medical underwriting
- There is a maximum benefit increase on each option
- Typically maximum number of options allowed (5)
- Options scheduled at yearly intervals
- Sometimes maximum benefit increases are limited to 1 or 2 times the original benefit
- Benefit increases must be evidenced by person's income increase. Require earned income statement from employer. Want to ensure benefits are within participation limits.
- Helps control anti-selection in addition to set option dates and enrollment period

(c)

Cost of Living Benefit

- Benefits increase automatically each year while disabled
- Inflation is the main reason behind this benefit. It aims at keeping the benefit adequate, especially when the disability continues for a long time
- Most of the time this benefit is sold as a separate rider.
- First increase after the first year of disability
- Benefit will be increased by a flat amount, percent compounded, or simple percent each year
- Can be connected to consumer price index
- When CPI used, there may be a maximum and minimum on the percentage increases
- Cost of living can be available with or without caps (typically max increase = 2-3 times of base benefit)

Question 4

70% replacement ratio means retirement benefit should be 70% of final salary.

$$70\%(162,624) = 113,836.80$$

Components of retirement benefit are:

- 1) Social Security = 11,700
- 2) Personal savings (annual amount)
- 3) Employer sponsored plan

Need to calculate (2), then subtract (1) and (2) from 113,836.80 to get personal savings.

To calculate (2):

$$\begin{aligned} FAS &= (S_{64} + S_{63} + S_{62} + S_{61} + S_{60}) / 5 \\ &= 162,624 \times (1 + v + v^2 + v^3 + v^4) / 5, \text{ where } v = 1 / 1.03 \\ &= 153,422.68 \end{aligned}$$

$$\begin{aligned} B_n &= FAS \times \text{years service} \times 1\% \\ &= .01 \times 153,422.68 \times (65 - 30) \\ &= 53,697.94 \end{aligned}$$

So annual personal savings needs to be $113,836.80 - 11,700.00 - 53,697.94 = 48,438.86$

To get this amount annually, the lump sum needed at 65 is:

$$\begin{aligned} \text{Annual amount} \times \text{annuity conversion factor at 65} &= \\ 48,438.86 \times 8.1958 &= 396,995.20 \end{aligned}$$

To accumulate 396,995.20 at age 65, you need to contribute (at the beginning of each year), where x is the % of salary each year:

$$\begin{aligned} 80,000x \left[(1.07^{25} + (1.03)(1.07^{24}) + \dots + (1.03^{24})(1.07)) \right] &= \\ 80,000x(1.07^{25}) \left[1 + 1.03 / 1.07 + \dots + (1.03 / 1.07)^{24} \right] &= \\ 80,000x(1.07^{25}) \left[1 - (1.03 / 1.07)^{25} \right] / \left[1 - (1.03 / 1.07) \right] &= \end{aligned}$$

$x = 5.56\%$ Must contribute 5.56% of salary each year to get 70% replacement ratio.

Question 5

(a)

Simplified net premium method is a prospective reserve method. It has the following assumptions.

- 1) death is the only decrement.
- 2) only include a death and endowment benefit
- 3) very conservative mortality and interest rate assumptions (prescribed by regulators)
- 4) death is assumed to happen at the end of the year or evenly distributed throughout the year
- 5) use formulas to get acquisition costs
- 6) don't include maintenance expense
- 7) net premium = $\frac{PVFB(0)}{FVFP(0)} \times \text{gross premium}$
net premium is used in calculation
- 8) include for acquisition costs: net level, fully preliminary term, Zillmer

(b)

Realistic net premium method is similar to (a), but include lapse and surrenders, surrender benefit and maintenance expenses.

It also uses a more realistic assumption, more conservative than pricing. Some assumptions may not be as refined as the pricing assumptions because:

- 1) Reserve is self-corrective (starts & ends at zero)
- 2) If the error has the similar effect on all policy years, then little effect on reserve
 - acquisition expenses specified by formula

$$\text{net premium ratio} = \frac{FVFB(0) + FVFE(0)}{FVFP(0)}$$

(c)

Gross premium method is similar to (b), but use 1 (one) as net premium ratio. It up-fronts profits at issue if use realistic assumption.

Usually use realistic assumptions with PAD (provision for adverse deviation) dictated by regulation.

If no PAD, called gross premium valuation

- actual acquisition expenses not considered

The above three are all prospective methods.

$\text{Reserve}(t) = PVFB(t) + PVFE(t) - \text{Net Premium Ratio} \times \text{PV of gross premium}(t)$.

(d)

Accumulation method is a retrospective reserve method. It is used when future premium and benefits are not certain. It's used often for dynamic products with flexible premium. The account value is usually used as solvency and earning reserves.

Account value for solvency reserve if:

- 1) future guaranteed interest rate is not greater than valuation rate
- 2) future guaranteed COI charge is not greater than future death claims according to valuation mortality
- 3) future expense is not great than future expense charges.

DAC asset calculated and capitalized to amortize acquisition costs.

Question 6

Entry age = 40

$$\text{Benefit at 65} = 2\% \times 25,000 \times (1.05^{19} + 1.05^{18} + 1.05^{17}) \times \frac{1}{3} \times 25 = 30,107 = B_{65}$$

$$NC_{40} \times \frac{{}^s N_{40} - {}^s N_{65}}{{}^s D_{40}} = B_{65} \times \frac{D_{65}}{D_{40}} \times \ddot{a}_{65}^{(12)}$$

$$NC_{40} = \frac{30107 \times \frac{50}{245} \times 10}{\left(\frac{7100}{245 \times 1} \right)} = 2,120$$

$$NC_{45} = 2120 \times \frac{S_{45}}{S_{40}} = 2120 \times 1.05^5 = 2706$$

Total Normal Cost @ 1/1/2001 = 2706 × 10 participants = 27,060

Supplemental Liability = Actuarial Liability @ age 45 – Assets

- since Assets = 0, Supplemental Liability = Actuarial Liability

$$AL_{45} = PV_{45} B_{65} - PV_{45} NC_{45}$$

$$= 30,107 \times \frac{D_{65}}{D_{45}} \times \ddot{a}_{65}^{(12)} - 2706 \times \frac{{}^s N_{45} - {}^s N_{65}}{{}^s D_{45}}$$

$$= 24,736 \quad (\text{since } {}^s D_{45} = D_{45} \times 1.05^5)$$

$$\text{Supplemental Cost} = \frac{24,736}{\ddot{a}_{10}} \times 10 \text{ participants} = \frac{24,736 \times 10}{7} = 35,337$$

Annual Cost for Plan at 1/1/2001 = 27,060 + 35,337 = 62,397

Annual Cost for Plan at 12/31/2001 = 62,397 × 1.08 = 67,389

Question 7

- 1) Driving Force Behind the Product
 - Get idea from inside and outside the company
 - Compare company's current products
 - Assess in light of company weakness and strength
 - Determine service and cost and benefits
 - Calculate expected profit

- 2) External Product Driving Force
 - Planholder
 - employer wants good product to attract employee and meanwhile meant to control their cost
 - Agent/bank/broker/consultant
 - They want competitive product, otherwise they will sell other competitors' product
 - Also want good compensation
 - Direct Marketing
 - Do market research to find out customer need
 - Do survey to find unmet need
 - Focus on groups to test new products' competitiveness and weakness
 - Regulator
 - Need to reflect regulation specifics in product feature and rates

- 3) Internal Company Product Driving Force
 - Group sales office
 - Agent can tell you what product currently missing and information of competitors
 - Need good compensation
 - Also need sales commitment of sales force office
 - Home office staff
 - Consider strength of the company
 - Could try to meet perceived market needs
 - Could adjust product to best profitability, reduce risk or just keep competitive
 - Unique products feature can help sell the product at higher premium

- 4) Evaluating the Experience
 - Know the competition, know the products' unique features, know the administrative rules and underwriting rules
 - Get experience data
 - Find out what market is best for the product

- 5) Product Company Fit
 - If product fits target market, could be a quick success; otherwise need to find new market
 - Assure administrative system can support the product
 - Ascertain structure of benefit payment and incentive structure

- Effect of tax (reserve, premiums, benefit, imputed income)
- 6) Clarifying the Product
- Determine target market
 - Determine administrative rules and cost
 - Training the company staff
 - Profit could be subject to underwriting cycle
 - Use reinsurance to increase risk capacity, smooth fluctuations and design product
- 7) Expected Profit
- Could use lower profit margin if can:
- Get more sales
 - Amortize more fixed expenses
 - Less risky
 - Lower required capital
 - Keep core competitiveness

****END OF WRITTEN ANSWER SECTION****

**COURSE 5
AFTERNOON SESSION**

APPLICATION OF BASIC ACTUARIAL PRINCIPLES

SECTION C-WRITTEN ANSWER

SOLUTIONS

****BEGINNING OF EXAMINATION 5****
AFTERNOON SESSION

Question 8

(a)

Reasons:

- 1) To stay below retention limit
- 2) Use facultative reinsurance to underwrite the case with uncertainty about the risk
- 3) Partner with reinsurance to enter into new business line or products
- 4) Sell the product which the field force wants but the company does not desire
- 5) Manage taxes. Can substantially use reinsurance to produce given to offset previous losses
- 6) To smooth out fluctuation in earning
- 7) Leverage the business if the reinsurance required rate of return is lower than the company's
- 8) If reinsurance rate is lower than ceding company rate, profitable to reinsurance
- 9) Use reinsurance to enhance capital in order to write new business (financial reinsurance)
- 10) Use expertise of reinsurance in lieu of underwriting, products design, avoid compensation limit, fronting reinsurance

(b)

(i)

Total quote share = 24% + 36% = 60%

Retain = 100% - 60% = 40%

$$\therefore \text{Retain Amount} = (\$1,200,000 - \$100,000) \times 40\% = \$440,000$$

(ii)

Amount ceded to Alpha Life = $(\$1,200,000 - \$100,000) \times 24\% = \$264,000$

(iii)

Amount ceded to Beta Life = $(\$1,200,000 - \$100,000) \times 36\% = \$396,000$

Question 9

(a)

Underwriting large group life insurance plans considerations

- claims are high severity and low frequency
- exposed to anti-selection when employees are given a choice of benefit (e.g. optional life); can offset by higher participation rates.
- Need underwriting or evidence of insurability for larger face amount (especially above non-medical amount)
- Consider new benefit developed
 - o living benefits: if terminal illness
 - o problem if recovery
 - o Group Universal Life
- also need underwriting for late enrollees/entrants
- alternative funding arrangements may be limited since it may lose the tax advantages of benefit paid to beneficiary
- allow employee only to choose the amount of benefit restricted to multiple of earnings
- also restrict the employee to change their option only by the end of every year
- more DC cafeteria plans are used

(b)

Major considerations involved in underwriting large group disability

- Again, disability claims are volatile (high claims and low frequency)
- Rates vary by age, sex, industry/occupation and economic conditions
- Replacement ratio vary by occupation or level of benefits
- Need to integrate with social security benefit
- Should avoid to have total disability greater than pre-disability; for example:
 - (i) If replacement ratio is >50%, should reduce percentage of total benefit paid
 - (ii) May be to reduce the benefit by integrating with social security benefit
- Restrict the liberal definition of disability
 - o May only limit the use of “own occupation” definition to white/professional group
- Need healthy, financial group/company
 - o Therefore get commercial rating of the company regarding their financial strength
- Avoid companies that are overstaffed (since don't want to use disability benefits for unemployment)
- Avoid situation where layoffs are expected or company where there are high turnovers or seasonal workers
- Union is the worst; should avoid,
 - o But still need to help the union help control cost
 - o Is the union keeping good records of administration?
- Non-contributory group plan is the best (limited to anti-selection)

- Need to estimate earnings for commissioned sales (normally use last 12 month earnings); however, since earnings = sale commission, creates problems, e.g. when are they becoming disabled
- Disability claims seem to come in cycles; therefore, should save surplus in the good time
- Better to have tighter underwriting than increased rate

(c)

Past Experience Data

- Group life insurance
- Low frequency and high severity...volatility
- Need several years of experience
- Need to pool large experience of claims

(d)

Group Disability Income Plans

- Low frequency and high severity...volatility
- Need several years of experience
- Need to do large claims pooling
- Also need to validate the disability reserve

Question 10

(a)

United States

- Employer contributions are tax deductible to employer
- Employer contributions are not taxable income to employee
- Benefits received are not taxable
- Employee contributions are not tax deductible

Canada

- Benefits received are not taxable
- Private plan employer contributions are tax deductible
- Private plan employee contributions are not tax deductible

(b)

United States

- Employer contributions are tax deductible
- Employee contributions are not tax deductible
- There is imputed income on coverage over 50,000
 - o Take amount over 50,000, multiply by Table I factor, then subtract employee contributions
- If discriminatory plan, then key people have imputed income on all coverage
- Benefits received are not taxable

Canada

- Employer contributions are tax deductible
- Employee contributions are not tax deductible
- Imputed income to employee on amounts
- Benefits received are generally tax free

(c)

United States

- Benefits received are taxable to extent employer paid contribution
- Typically either all employer or all employee paid contributions

Canada

- Benefits received are taxable income

Question 11

(a)

Income Annuities

1) Mortality Assumptions – Important because of:

- Anti-selection (healthiest lives only want coverage)
- Mortality improvements (since life expectancy up, income annuities are more expensive)
- Longevity risk (consistent with higher cost from longer life)

2) Dangers Interest Rate/Investment Income Dangers – very important (most important)

- Guaranteeing high interest rates without investing properly
- Disintermediation risk if back short term assets with long term liabilities (e.g., the annuity has a SU with no SC)

- Ways to Protect
 - o For single premium income annuities (most common), match assets to liabilities
 - o For short term, volatile cash flows make sure assets are short term

- Also Consider
 - o Balance risk with competitive product (need to keep customer happy, but survive too)
 - o Also consider default risk (if backing liabilities with risky assets to try and get a higher return)

3) Expenses

- Small risks – have to consider average premium and sales volatility
- Ongoing Assumptions:
 - o valuations
 - o make sure annuitant is still alive
 - o cost of making payment (e.g. check)

4) Lapses, Surrenders

- These are very, very rare in income annuities. If you did offer surrenders, there would be huge anti-selection (people on death row would surrender!)

(b)

Accumulation Annuities

1) Mortality assumption – not too important

- Have to consider more closely if there is a guaranteed minimum Death Benefit

2) Investment Income/Interest Rate

- For deferred annuities, have to consider the spread (earned-credited) rate.
- There will be a lag in the amount (credited) paid by 1 period

Variable Annuities

- Mostly risk of lower charge (because it's a percent of the asset value), but if bad investment income:
 - o less profits (less asset value charges)
 - o could cause lapses because policyholder upset or even had dried up the account!

3) Expenses – same average premium and sales volatility to consider

- Also ongoing expenses with accumulation annuities
- Tracking commissions on flexible product
- Customer inquiries
- Processing surrenders, authorizations, policy loans, etc.
- Producing periodic reports to show to policyholder

4) Surrender/Lapses

- Factors that have high surrenders/lapses:
 - o no surrender charge
 - o younger issue age
 - o market interest rate is bigger than crediting rate

5) Premium Payment Pattern

- Will depend on:
 - o purpose of product
 - o resources of buyers
 - o tax treatment (huge importance)

6) Annuitization

- Very important for guaranteed minimum income bracket and two-tiered annuities
- Could track only profit/loss resulting from annuitizations in pricing, or
- Could track all features of each product over its lifetime

Question 12

(a)

Traditional Unit Credit

Benefit payable at normal retirement = b_x based on plan provisions service and salaries to date

Normal cost = Present value of benefits earned over the next year

$$(b_{x+1} - b_x) \times \ddot{a}_R^{(12)} v^{R-x} {}_{(R-x)}P_x$$

difference between next year's benefit and this year's benefit

$$\text{Accrued Liability} = b_x \times \ddot{a}_R^{(12)} \times v^{R-x} \times {}_{(R-x)}P_x^{(T)}$$

b_x = benefit earned as of age x payable commencing at age R

$\ddot{a}_R^{(12)}$ Present Value at Age R of monthly annuity commencing at age R

$$v^{R-x} = \left(\frac{1}{1+i} \right)^{R-x} - \text{discount for interest from age } R \text{ to age } x$$

$${}_{(R-x)}P_x^{(T)} = \text{probability of surviving and staying in plan from age } x \text{ to age } R$$

Accrued liability is the present value of the benefit accrued to date = PV (accrued benefit)

Normal cost is the Present Value of the additional benefit that will be earned over the coming year

(b)

Projected Accrued Benefit

B_R = Projected benefit at retirement including all years of service and future benefit increases

Accrued Liability = Present value as of age x of projected benefit at retirement

Prorated by service at age x / service at age R

$$= \text{PV (Projected Benefit)} \times \frac{\text{current service}}{\text{total service}}$$

Projected unit credit reflects the effect of future salary increases on the benefit earned to date.

Question 13

(a)

Step 1: Determine new average rate

$$\text{Loss cost} = \frac{\text{losses, trended \& developed}}{\text{units of earned exposure}}$$

$$\text{New Average Rate} = \frac{\text{Loss cost}}{\text{Permissible loss ratio}}$$

$$\text{Loss Cost} = \frac{1,100,000 + 1,200,000 + 400,000}{50,000 + 30,000 + 20,000} = \frac{2,700,000}{100,000} = 27$$

$$\text{New Average Rate} = \frac{27}{0.6} = 45$$

$$\text{Old Average Rate} = \frac{(40)(50,000) + (50)(30,000) + (75)(20,000)}{100,000} = 50$$

$$\therefore \text{Average rate } \Delta = \frac{45}{50} - 1 = -10\%$$

Step 2: Change differentials

$$\text{Indicated differential}_i = \frac{LC_i}{LC_{base}}$$

Use class A as base (largest exposure)

$$LC_A = 1,100,000 / 50,000 = 22$$

$$LC_B = 1,200,000 / 30,000 = 40$$

$$LC_C = 400,000 / 20,000 = 20$$

$$\text{Ind Diff}_B = 40 / 22 = 1.82$$

$$\text{Ind Diff}_C = 20 / 22 = 0.91$$

Step 3: Balance back

$$\text{Off-balance factor} = \frac{\text{Proposed average differential}}{\text{Existing average differential}}$$

$$\begin{aligned}\text{Off-Balance factor} &= \frac{(1)(50,000) + (1.82)(30,000) + (0.91)(20,000)}{(1)(50,000) + \left(\frac{50}{40}\right)(30,000) + \left(\frac{75}{40}\right)(20,000)} \\ &= \frac{122,800}{125,000} = 0.9824\end{aligned}$$

$$\text{Final base rate (class A)} = (40)(1-10\%) \left(\frac{1}{0.9824} \right) = 36.64$$

$$\text{Class B rate} = (36.64)(1.82) = 66.69$$

$$\text{Class C rate} = (36.64)(0.91) = 33.34$$

$$\text{Double check: new average rate} = \frac{(36.64)(50,000) + (66.69)(30,000) + (33.34)(20,000)}{100,000} = 45$$

(b)

Step 1: Determine new average rate

$$\text{Loss ratio} = \frac{\text{\$losses, trended \& developed}}{\text{\$premiums @ current rates}}$$

$$\text{Indicated rate } \Delta = \frac{\text{loss ratio}}{\text{permissible loss ratio}} - 1$$

Loss ratio

$$\begin{aligned}&= \frac{1,100,000 + 1,200,000 + 400,000 + 2,600,000 + 2,640,000 + 2,400,000}{(40)(50,000) + (50)(30,000) + (75)(20,000) + (80)(60,000) + (100)(40,000) + (150)(20,000)} \\ &= \frac{10,340,000}{16,800,000}\end{aligned}$$

$$= 0.6155$$

$$\text{Indicated rate } \Delta = \frac{0.6155}{0.6} - 1 = 2.58\%$$

Step 2: Change differentials

$$\text{Indicated differential}_i = \text{existing differential}_i \times \frac{LR_i}{LR_{base}}$$

Assume territory 2 is base territory (largest exposure)

$$LR_2 = \frac{2,640,000 + 2,600,000 + 2,400,000}{(80)(60,000) + (100)(40,000) + (150)(20,000)}$$

$$= \frac{7,640,000}{11,800,000} = 0.6475$$

$$LR_1 = \frac{1,100,000 + 1,200,000 + 400,000}{(40)(50,000) + (50)(30,000) + (75)(20,000)}$$

$$= \frac{2,700,000}{5,000,000} = 0.54$$

$$\text{Indicated differential}_i = (0.5) \left(\frac{0.54}{0.6475} \right) = 0.417$$

Step 3: Balance back

Off Balance factor =

$$(1)(60,000) + \left(\frac{100}{80} \right) (40,000) + \left(\frac{150}{80} \right) (20,000) + (.417)(50,000)$$

$$+ (.417) \left(\frac{100}{80} \right) (30,000) + (.417) \left(\frac{150}{80} \right) (20,000)$$

$$(1)(60,000) + \left(\frac{100}{80} \right) (40,000) + \left(\frac{150}{80} \right) (20,000) + (.5)(50,000)$$

$$+ (.5) \left(\frac{100}{80} \right) (30,000) + (.5) \left(\frac{150}{80} \right) (20,000)$$

$$= \frac{199,625}{210,000} = 0.9506$$

$$\text{Final balance rate (Territory 2, Class A): } (80)(1.0258)\left(\frac{1}{0.9506}\right) = 86.33$$

$$\text{Territory 2, Class B rate} = (86.33)\left(\frac{100}{80}\right) = 107.91$$

$$\text{Territory 2, Class C rate} = (86.33)\left(\frac{150}{80}\right) = 161.87$$

$$\text{Territory 1, Class A rate} = (86.33)(0.417) = 36.00$$

$$\text{Territory 1, Class B rate} = (86.33)(0.417)\left(\frac{100}{80}\right) = 45.00$$

$$\text{Territory 1, Class C rate} = (86.33)(0.417)\left(\frac{150}{80}\right) = 67.50$$

$$\text{Double check: new average rate} = \frac{17,233,600}{220,000} = 78.33$$

$$\text{Old Average Rate} = \frac{16,800,000}{220,000} = 76.36$$

$$\text{Average rate } \Delta = 2.575\%$$

Question 14

Required capital is the target or minimum level of capital needed by a company. It is the amount of capital a company needs to withstand reasonable fluctuations in results.

Risks covered in required capital calculation:

1) Asset Default Risk

- Asset default risk is the risk that an asset permanently loses value.
 - o When this occurs the company must reduce the value of the asset shown on its books.
 - o This directly reduces capital and may reduce earnings.
 - o There may be different default risk factors for different type of assets and for different categories within an asset type.

2) Insurance Risk

- Insurance risk is primarily the risk that mortality or morbidity experience exceeds to the levels anticipated in pricing
 - o Can result from random fluctuations or incorrect assumptions used in pricing
 - o Random fluctuations usually become less significant as the size of the company increases
 - o This risk may also include the risk of pricing assumptions for persistency, expenses and investment income

3) Interest Rate Risk

a) Disintermediation Risk

- Risk of having to sell assets at a loss to fund substantial cash outflows

b) Guarantee Risk

- Risk that the interest rate guaranteed in a product exceed the interest rates earned on investments

c) Liquidity Risk

- Risk that assets cannot be sold fast enough to cover cash demands on liabilities.
- Important for life insurance companies because most liabilities are payable on demand and most assets are invested long term.

4) Interest Spread Risk

- The risk of insufficient interest spreads due to investment and pricing decisions
- May be due to one or more of the following:
 - o Coordination problem between investment, pricing and administration areas
 - o Insufficient availability of investment opportunities
 - o Similar competing products offer attractive crediting rates

5) Other Risks

These include:

- Mispriced products
- Lawsuits
- Changes in tax laws
- Adverse publicity
- Change in regulations

****END OF COURSE 5 EXAMINATION****
AFTERNOON SESSION