November 2000
Course 8F

Society of Actuaries

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

Questions 1 – 5 pertain to the Case Study. Each question should be answered independently.

1. *(7 points)* You have been hired recently to head up Zest's Capital Management Unit. You have prior experience at other public and private financial institutions.

Zest has found that a market exists for providing recordkeeping services to a variety of pension plans. The company is considering two approaches to this market.

Zest feels that it can create this service in-house and can add value to the organization by providing these services at a start-up cost of 80.

Alternatively, Zest has learned that Duz-It-All Pensions, Inc. (DIAP) is available for sale for 100. DIAP is a full-service defined contribution plan provider that services the small-business and medium-business market. It provides both recordkeeping and links to many household-name mutual funds, but does not actually own any of the invested plan assets.

Assume that Zest has a hurdle rate of 15% on any new projects. Zest's senior management subscribes to the "Pecking Order Hypothesis" of corporate leverage.

(a) Describe the various ways to rank capital budgeting projects. Recommend one method for Zest to use. Support your recommendation by listing the advantages of that method.

(b) After careful consideration, Zest's senior management chooses to purchase DIAP. Describe how Zest's management will use the "Pecking Order Hypothesis" to determine how to finance this project. Indicate which form of financing Zest will choose by describing the assumptions and implications of the hypothesis.

(c) Report on real-world observations that contradict the "Pecking Order Hypothesis", based on your varied background. Recommend your choice of financing for the DIAP purchase. Support your recommendation with information from the case study.

Questions 1 – 5 pertain to the Case Study. Each question should be answered independently.

2. *(9 points)* You currently are the Risk Director of the Asset Liability Management (ALM) Unit within the medium-sized US bank that Alpine acquired in 1998. You have been approached by the management team of Alpine to run the ALM unit within Zest.

You find the following situation at Zest:

Asset Investment Allocation

	Assets by Segment				
Asset Class	Ind Term Life	GIC's	Group LTD	Total	Duration
Bonds – Public	67.5	1,430.6	862.9	2,361.0	3.00
Bonds – Private	45.0	953.7	575.3	1,574.0	4.00
Commercial Mortgages	14.1	364.7	371.3	750.1	7.00
Equities	7.0	56.1	300.7	363.8	-
Real Estate	7.0	-	-	7.0	10.00
	140.7	2,805.0	2,110.2	5,055.9	3.64

Assume that the assets allocated by segment include 110% of the liability values to provide a notional level of surplus within each segment.

(a) Calculate the asset duration (dollar-weighted average) for each line of business and comment on its relationship to the liability duration.

(b) Explain what the "market value of equity" and "economic equity ratio" targets measure. Indicate which constituencies are interested in each measure and explain why.

(c) For the GIC line of business, assume that the average yield on the assets is 7.50% and that the average crediting rate is 6.50%. Calculate the changes in the "market value of equity" and the "economic equity ratio" for that segment resulting from a 1.00% increase in the interest rates.

(d) For the GIC line, find the asset durations that hedge the "economic equity ratio" and "market value of equity".

(e) Recommend an ALM technique that Zest could adopt, and support your recommendation.

Questions 1 – 5 pertain to the Case Study.

Each question should be answered independently.

3. *(6 points)* You are a compensation specialist for the firm Performance Plus. You have been retained by the Board of Directors of Zest to review the compensation structure of Zest's senior management team.

Your review indicates that senior management compensation with respect to salary, standard benefits, and perquisites is comparable to executives of other companies in similar positions.

Zest's incentive compensation is in the form of equal portions of cash and stock. Incentive compensation targets are established with respect to profitability, new sales, and personal objectives. The weighting of each component in determining total incentive compensation varies by position.

If targets are achieved, 100% of the incentive compensation is realized. The incentive compensation can be as high as 150% of the base incentive compensation, or as low as 50% of the base incentive compensation. Base incentive compensation is defined as 100% of salary.

The table below indicates the average compensation for 1997 and 1998, as well as the component incentive compensation allocation weightings, of the senior management team.

			Weighting of Incentive Compensation Components		
	Base Salary	Incentive Compensation	Profit Target	New Sales	Personal Objectives
Chief Executive Officer	500,000	600,000	20%	60%	20%
Vice-President, Marketing	200,000	250,000	10%	70%	20%
Vice-President, Underwriting	130,000	150,000	0%	60%	40%
Chief Actuary	180,000	200,000	10%	50%	40%
Chief Financial Officer	160,000	180,000	10%	50%	40%

(a) List possible components of an incentive compensation structure, and describe the role each plays.

(b) Analyze the incentive compensation structure of Zest's senior management team. Comment on its appropriateness and suggest any changes. Justify your recommendations.

Questions 1 – 5 pertain to the Case Study.   Each question should be answered independently.

4. *(9 points)* Displeased with the current stock price and under intense shareholder pressure, Zest's president Pat Arnold has announced a new growth strategy designed to add significant shareholder value. In her statement to the press, Arnold talked about the role of a financial intermediary such as Zest and, in that role, how Zest creates shareholder value by prudently taking on and managing risk.

When asked for specific details, Arnold replied as follows: "We see future earnings growth potential coming from wealth management. We have a sales plan that will see our current GIC portfolio doubling within two years. Consistent with this growth strategy, we will be exploring all of our reinsurance arrangements and in all likelihood will be recapturing the vast majority of this business."

Although Arnold did not mention it in the press conference, it is her intention to double the current allocation of below investment grade investments as she feels the increased yield will be necessary to attract the additional GIC revenues.

Arnold asks you, the chief actuary, to prepare an implementation strategy. Arnold also gives you the approval you have been seeking to proceed with an interest rate swap program to help manage interest rate risk. Zest has never used derivatives before.

(a) Explain how the theory of financial intermediation supports Zest's goal of increased growth.

(b) Outline the additional risks that Zest will face as a result of the new strategies and recommend a practical approach to addressing each risk.

(c) Predict how NARA is likely to react to the new strategy, and describe the implications to Zest that would result from any action NARA may take.

(d) Briefly describe the elements to be included in a "best practices" approach to implementing the new derivatives strategy.

Questions 1 – 5 pertain to the Case Study.

Each question should be answered independently.

5. *(6 points)* Zest calculates reserves for its term life insurance using the Net Level Premium method of valuation. The local regulator is suggesting that reserving will move to a Gross Premium valuation method, using Canadian-style valuation interest rates and the methods discussed in Valuation Technique Paper #3 (VTP-3) to determine reinvestment interest rates.

Zest currently allocates only risk-free bonds to support its term life insurance reserves. The chief actuary feels a less conservative investment strategy is appropriate and suggests the following asset mix:

Risk-free bonds:	50%
Investment grade private bonds:	25%
Non-investment grade private bonds:	25%

Zest will set reinvestment assumptions in accordance with VTP-3. The duration of Zest's assets is approximately equal to that of its liabilities. Zest allocates no investment expenses to its term life business.

The chief actuary has determined the following information as of December 31, 1999:

• Net Level Premium reserves:	127.9
• Gross Premium valuation interest rate:	6% (years 1-20), 5% (years 21+)
• Reserves using Gross Premium valuation:	135.0
• New valuation interest rate, using VTP-3 and revised asset mix:	6.5% (years 1-20), 5% (years 21+)
• Reserve using new valuation interest rate:	130

(a) Detail the methodology the chief actuary would have used in determining the reinvestment assumptions underlying the valuation interest rate for the Gross Premium valuation method. Indicate what is implied by the new valuation interest rates.

(b) Calculate the impact on required and available capital as of December 31, 1999 of moving to this new asset allocation and valuation method using NARA's capital requirements. Show your work.

6. *(14 points)* You are the CFO for a large insurance company called Deep Pockets (DP). DP's liabilities consist primarily of reserves for traditional life insurance products.

A smaller insurer in your city called Push the Limits (PL) is having financial difficulties. PL's liabilities consist of the following:

- 400m of GIC's with credit rating bail-out provisions, backed by zero-coupon bonds, both maturing in 5 years;
- 100m of bullet GIC's with no bail-outs;
- 200m of variable annuities with a death benefit that is paid at the end of the year of death equal to the greater of the account value at that time and the sum of premiums paid;
- 50m of front-loaded variable annuities without any death benefit;
- 100m of fixed annuities without any remaining surrender penalty; and
- 150m of annual-ratchet equity indexed annuities.

PL has 100m in surplus with an internal required surplus of 80m.

Assume a current risk-free rate of 6% and that interest rates have risen 200 basis points since the asset portfolio was last re-balanced. PL's investment officer thinks that she would need six months to liquidate PL's assets at fair market value. Alternatively, she can liquidate today with 35% of the assets at fair market value and the remaining assets at 20% below fair market value.

PL has reason to believe that it will be downgraded by the rating agencies, triggering the GIC bail-outs. DP has been approached regarding a potential buy-out of PL to help PL avoid a run by policyholders.

(a) Describe the goals and methodologies of rating agencies.

(b) Assume the bail-out GIC's are immediately called at 400m. Calculate the potential loss and the resulting surplus of PL. State any assumptions used in your calculation.

(c) Describe the advantages and disadvantages to DP's investors of diversifying into annuities by purchasing PL.

(d) Describe how solvency-based reserves could be developed for each block of annuity business. Indicate additional information that would be needed in order to calculate the actual reserve values.

(e) Describe the process of determining how much additional leverage DP can support at a 10% shortfall level.

7. *(6 points)* You are the regulatory actuary for the land of Oz. The wizard has asked you to recommend a reserving method for a revolutionary new product called 5-year renewable term.

The product is issued on a smoker-distinct and sex-distinct basis. Premiums are fully guaranteed and increase every 5 years. The maturity age is 75.

(a) Describe how the product would be valued under the unitary reserve method and Guideline XXX.

(b) Describe situations under which premium deficiency reserves will result under each of the two valuation methods in (a).

(c) Propose which of the reserve methods should be used in Oz, taking into consideration the level and pattern of the reserves under each method.

8. *(3 points)* Explain the advantages of private placements to both issuers and investors relative to comparable registered offerings.

****END OF EXAMINATION****
MORNING SESSION

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

Beginning with Question 9

9. *(4 points)* You are the Valuation Actuary for a small U.S. stock life insurance company. You have completed cash flow testing for your universal life product using three alternative investment strategies.

50 Monte Carlo tests were run. The following table summarizes the results (in thousands of dollars):

Scenario	Strategy	Average Surplus	Standard Deviation	Number of Negative Scenarios	Highest Outcome	Lowest Outcome
A	Current Coupon GNMA	26,678	19,325	5	62,320	-96,399
B	5-Year AAA Corporate Bonds	28,153	13,240	1	58,140	-21,043
C	Highest yielding investment	31,989	28,213	11	115,544	-82,034

Evaluate the three scenarios. Recommend which of the investment strategies should be used. State your criteria for selection and justify your choice.

10. Skylark Insurance Company is a medium sized stock life insurance company. The company writes term insurance, whole life insurance, and annuity products for middle-income individuals on the West Coast. There has been a steady decline of new business sales over the past few years.

The CEO of Skylark believes that the steady decline is due to two factors:

- The insurance needs of Skylark's target market have largely been satisfied.
- Competition from other types of financial products has increased.

As a result, the CEO has become concerned about how Skylark will survive in the changing financial services marketplace. A vice president at Skylark has proposed that Skylark strengthen its competitive position by purchasing another financial intermediary. The vice president has identified two companies that Skylark could possibly acquire.

<u>Acquisition A</u>: Neighborhood Bank

Neighborhood Bank is a small retail bank with branches in several states on the East Coast. The bank offers deposit accounts, home mortgages, and other loans to middle income families and small businesses. The purchase price of the bank is $17 million to be paid on 1/1/2001. The vice president has projected the income statement for the bank as follows.

Projected Income Statement for Neighborhood Bank
All values in $ millions

	2001	2002	2003
Interest Income	16.0	18.0	20.0
Other Income	3.0	3.2	3.4
Total Revenues	19.0	21.2	23.4
Interest Expense	11.5	12.5	13.6
Loan Loss Provision	5.0	5.1	5.2
Other Expenses	3.7	4.6	5.0
Total Expenses	20.2	22.2	23.8
Net Income Before Taxes	-1.2	-1.0	-0.4

10. (Continued)

The loan loss provision is the only non-cash item included in the income statement.

The vice president estimates that the present value of the bank's post-2003 after-tax cash flows as of December 31, 2003, discounted at Skylark's cost of capital, is $30.9 million. The internal rate of return of the bank purchase is estimated at 22.1%. The cumulative after-tax cash flows are projected to reach $16.1 million in 2005 and $20.0 million in 2006.

Acquisition B: Prosper Mutual Fund

Prosper Mutual Funds is a mutual fund company that is having great success marketing its funds through the internet. It has also developed an innovative financial planning process that allows it to provide financial advice for a fee using the internet. The purchase price of Prosper is $20 million to be paid on January 1, 2001. The vice president has projected Prosper's income statement as follows:

Projected Income Statement for Prosper Mutual Fund Company
All values in $ millions

	2001	2002	2003
Fees	5.0	6.2	7.4
Other Income	3.0	3.6	4.3
Total Revenues	8.0	9.8	11.7
Total Expenses	10.0	11.5	12.7
Net Income Before Taxes	-2.0	-1.7	-1.0

20% of Prosper's income is derived from a foreign subsidiary.

No non-cash items are included in the projected income statement.

The vice president estimates that the present value of Prosper's post-2003 after-tax cash flows as of December 31, 2003, discounted at Skylark's cost of capital, is $65.5 million. The internal rate of return of the Prosper purchase is estimated at 20.2%. The cumulative after-tax cash flows are projected to reach $18.7 million in 2009 and $26.7 million in 2010.

10. **(Continued)**

Other Information:

Skylark is willing to invest up to $20 million. Its cost of capital is 15%.

The risk adjusted before-tax return on fully taxable bonds is 12%. The risk adjusted before-tax return on tax-exempt bonds is 8.4%. The local and foreign jurisdictions have the same income tax rate.

(a) *(4 points)* Evaluate the strategic fit of Skylark with each of its acquisition prospects within the context of "One System of Financial Intermediation: A New Paradigm".

(b) *(4 points)* Describe the risks Skylark needs to consider when making each purchase decision and the steps it can take to minimize them.

(c) *(9 points)* Outline your analysis of each purchase proposal and recommend which company, if any, Skylark should purchase. Support your recommendation.

11. *(3 points)* The advent of the internet has made it much easier to gather information on public companies. Individual investors can utilize this information and then use online trading to directly purchase stocks with minimal transaction costs.

Describe how mutual fund companies can add value for their customers in this environment.

12. Hamilton United Gas and Electric (HUGE) plans to raise $10M to finance the construction of a new plant. HUGE's total expected profits, before the interest cost of the new plant, are $5M per year for the next 10 years. The company currently has $15M of net operating losses which expire in 3 years.

HUGE is considering the following two financing options:

- A 10-year bond with annual interest of 10%. The interest will be tax deductible for HUGE and fully taxable for the investors.
- Preferred stock with mandatory redemption after 10 years. The annual dividend will be 8%. HUGE is assuming the dividend will not be tax deductible for HUGE and that 30% of the dividend will be taxable for the investors.

Assume:

- The risk of default is the same between the bond and the preferred stock.
- The discount rate is 0%.
- The corporate tax rate for HUGE is 50% of taxable income.

(a) *(1 point)* Determine the minimum tax rate that an investor must have in order to choose the preferred stock over the bond.

(b) *(3 points)* Describe the tax risks an investor faces if he purchases the preferred stock. Outline how the investor can mitigate these risks.

(c) *(2 points)* Calculate the average tax rate for HUGE over the 10-year period under each financing option. Show your work.

13. You are the chief (and only) actuary for Neverland Mutual, a small mutual insurance company. Neverland primarily writes traditional and universal life insurance and flexible premium deferred annuities. Recently, universal life and deferred annuity sales have been far outpacing traditional life sales.

As of the end of 1999, Neverland had a capital position equal to 110% of required capital. However, the three-year planning projection shows that, given planned sales, Neverland's capital will fall below the level of required capital within two years.

End of Year	1998 Actual	1999 Actual	2000 Projection	2001 Projection	2002 Projection
Assets	10,575	12,649	15,133	18,125	21,671
Reserves	10,000	12,000	14,400	17,297	20,736
Capital	575	649	733	828	935
Required Capital	500	590	705	845	1005
Capital Ratio	115%	110%	104%	98%	93%

- Required Capital = (2% of Assets) + (2% of Reserves) + (0.3% of Net Amount at Risk)

- Neverland uses Level ROE as its profit measure. Its product lines have the following levels of profitability:

Traditional Life	10%
Universal Life	13%
Flexible Premium Deferred Annuity	15%

- The projected equity growth rate for each of the product lines is:

Traditional Life	5%
Universal Life	20%
Flexible Premium Deferred Annuity	15%

- The current risk free rate is 6%.

- Neverland's risk premium is 5%.

13. (Continued)

(a) *(4 points)* Evaluate whether each of Neverland's product lines is creating or destroying economic value and whether each line is generating free cash flow. Explain the implications of your evaluation.

(b) *(2 points)* Explain how Neverland's aggressive sales plan is contributing to its declining capital position.

(c) *(2 points)* Describe how reinsurance can be used to improve Neverland's capital position.

(d) *(1 point)* Describe how demutualization might help to alleviate Neverland's capital problem.

(e) *(2 points)* Indicate the situations where demutualization is preferable to reinsurance.

14. *(6 points)* You are forming a consulting firm in the United States with four other actuaries. Your firm's primary practice area will be Risk-Based Capital analysis, especially as it applies to banks.

Bank A and Bank B are your first two potential clients. You are given the following information for the two banks:

Assets:		Conversion Factor	Risk Weight	Values for Bank A	Values for Bank B
	Commercial Loans		100%	600,000	800,000
	Mortgages		50%	400,000	280,000
	Loan Loss Allowance			(58,000)	(74,000)
	90-day Treasury bills		0%	360,000	600,000
Off-Balance Sheet Items:					
	Unused Loan Commitments	50%	100%	1,400,000	1,200,000
	Standby Letters of Credit	100%	100%	960,000	200,000
Capital Components:					
	Common Equity			92,000	120,000
	Loan Loss Allowance			58,000	74,000
	Perpetual Preferred Stock			84,000	24,000

(a) Describe two appropriate legal forms of business organization for your firm. Include advantages and disadvantages. Support why each might be the appropriate choice.

(b) Compare the relative strength of the two banks using:

(i) the former Primary Capital Standards;

(ii) the Federal Reserve Bank's Risk-Based Capital Standards.

(c) Outline the shortcomings of each measure in (b).

15. *(5 points)* Your company sells a variety of guaranteed interest products. As a member of the risk management committee, you have been asked to comment on the following excerpts taken from a recent investment department commentary.

(i) "We are forecasting a period of increasing interest rates **. . . .** our strategy is to buy short assets to support new sales."

(ii) "We intend to increase our mortgage holdings. Our model, which assumes a level pre-payment rate of 5%, indicates that mortgages are attractive investments."

Outline your report.

16. *(4 points)* You are the investment actuary for XYZ corporation, a publicly-traded financial services institution. The CEO would like to raise additional capital to fund an attractive investment opportunity. He is considering whether to raise capital through a common stock offering, a public debt offering, or a private bank loan. His biggest concern is the potential impact on the company's stock price that each financing alternative might have.

Explain how "information asymmetry" between management and investors can impact the stock market's reaction to each financing alternative.

17. You are the CFO of a newly demutualized, well-capitalized life insurance company domiciled in the U.S. Most of your policyholders accepted shares at demutualization. You are developing a dividend policy for your new shares. Your controller believes that no dividends should be paid since this would involve significant frictional costs. Your investment banker suggests that you should pay cash dividends since the company is extremely profitable.

(a) *(3 points)* Outline the issues you would need to consider in setting a dividend policy.

(b) *(1 point)* Suggest a method of returning profits to shareholders other than cash dividends.

****END OF EXAMINATION****
AFTERNOON SESSION