BEGINNING OF EXAMINATION
FINANCE AND ENTERPRISE RISK MANAGEMENT; CORE SEGMENT
MORNING SESSION

Questions 1-3 pertain to the Case Study.
***Each question should be answered independently*.**

1. *(7 points)* Zoolander Life is very concerned about being able to secure reinsurance for its term life insurance business line after January 1, 2005. Richard Scarlet, the reinsurance intermediary, has been unable to secure a replacement for Rose Re's YRT reinsurance program at a reasonable price.

As an alternative, Richard Scarlet has proposed accepting a 100% funds withheld coinsurance contract which is available from Cranberry Reinsurance Solutions. Under that arrangement, the reinsurance allowance is set at 10% of ceded premiums, and the risk charge is 1% of the outstanding surplus account for the prior year.

A simplified income statement for the term life insurance business line follows:

Zoolander Life Projected 2005 Term Life Business Line Before Reinsurance	
Premiums	
Gross	33,000,000
Ceded	0
Net Premiums	33,000,000
Investment Income	
Gross	1,650,000
Ceded	0
Net Investment Income	1,650,000
Reinsurance Allowance	0
Total Revenue	34,650,000
Claims & Surrenders	
Gross	19,000,000
Ceded	0
Net Claims & Surrenders	19,000,000
Reserve Increase	
Gross	11,000,000
Ceded	0
Net Reserve Increase	11,000,000
Total Benefits	30,000,000
Expenses & Commissions	3,500,000
Gain from Operations	1,150,000

(a) For Zoolander Life, show:

   i. the change in the income statement for 2005 under a 100% funds withheld coinsurance arrangement

   ii. the outstanding surplus account as of December 31, 2005.

(b) Explain, from Zoolander's perspective, the benefits of their existing YRT reinsurance as compared to the benefits of Cranberry's proposed arrangement.

(c) Recommend if Zoolander should purchase the reinsurance from Cranberry Re or should retain the risk. Defend your answer.

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2. *(11 points)* Bonnie Hawke, Zoolander Life's 2nd Vice President of Capital Planning, proposes to allocate capital by line of business using the GAAP required surplus methodology. You are given the following information.

Zoolander Life Proposed Capital Allocation		
Line of Business	**2003**	**Projected 2004**
Annuity	100.0	103.0
Disability	150.0	160.0
Life Insurance	200.0	240.0
Variable	215.0	225.0
Corporate	367.6	390.0
Total	1,032.6	1,118.0

(a) Explain why a company might choose to allocate capital by line of business.

(b) Evaluate the appropriateness of the proposed allocation method chosen by Bonnie Hawke as compared to other capital allocation methods.

(c) Using Bonnie Hawke's proposed allocation, determine whether each line of business is projected to create or destroy economic value in 2004 and whether each line of business is projected to generate free cash flow. Show your work.

(d) Explain the implications of the results in (c) above.

Questions 1-3 pertain to the Case Study.
Each question should be answered independently.

3. *(11 points)* In a recent private conversation with you, Bill Buck, Zoolander's new 2nd Vice President of Enterprise Risk Management, expressed his concern about Zoolander's current compensation structure and top management's frequent absences.

He added, "I fear being caught in a situation similar to Enron or Barings. With the shareholders, Board of Directors, rating agencies and management all monitoring those companies, why wasn't anyone aware of the problems before it was too late?"

(a) *(2 points)* Identify the items in Zoolander's current compensation structure that create improper incentives and explain how they could impact the company's financials.

(b) *(1 point)* Describe the concerns a shareholder may have with the structure of Zoolander's compensation system.

(c) *(4 points)* Describe the roles that the shareholders, Board of Directors, rating agencies, and management should each play to ensure that a company does not fail.

(d) *(4 points)* Identify areas where Zoolander's shareholders, Board of Directors, rating agency and management are not meeting their obligations.

4. *(13 points)* You are the CFO for Van Halbach Airlines. Research has determined that adding routes to Nebraska would be very profitable if fuel costs remain level or drop. Financing of 100 million is needed to add the additional routes.

Assume the following:

- Only 2 scenarios exist for the next year: fuel costs remain level or they increase.
- The value of the additional routes in 1 year is 250 million if fuel costs remain level.
- The value of the additional routes in 1 year is 30 million if fuel costs increase.
- Risk-free rate is 3%.
- Cost of Equity Capital is 10%.
- Cost of Debt Capital is 6%.
- Probability that fuel costs remain level is 50%.
- Risk neutral probability that fuel costs remain level is 60%.

(a) *(4 points)* Describe advantages and disadvantages of financing the route expansion through each of the following methods:

- Equity
- Public debt
- Private debt
- Hybrid debt

(b) *(6 points)* Calculate the value to Van Halbach of the additional routes under each of the following scenarios. Show your work.

- The financing is from the issuance of common stock
- The financing is evenly split between common stock issuance and public debt
- The financing is from public debt

(c) *(2 points)* Recommend a financial structure for the route expansion based on your analysis in (a) and (b) above. Support your position.

(d) *(1 point)* Assume derivatives exist to hedge the price of fuel. Explain whether your recommendation in (c) would change. Support your position.

5. *(9 points)* You have been asked to perform an analysis of the ALM function of Murray Life. Below is information concerning the assets and liabilities of Murray Life:

Assets	Market Value	Effective Duration
Bonds	7.0	6.0
Mortgage Backed Securities	4.5	4.8
Stocks (Preferred & Common)	2.5	0.0
Mortgage Loans	1.0	7.4
Short-Term Bonds	3.0	1.0
Total	18.0	

Liabilities	Fair Value	Effective Duration
Legacy SPDA	7.0	3.5
Whole Life Insurance	3.0	8.6
Term Life Insurance	5.0	4.2
Total	15.0	

Murray Life has added a new SPDA product which is not included in the above analysis. The new SPDA has a liability fair value of 2.0 and an effective duration of 2.5. The assets backing this liability are yet to be invested. The available investment choices are limited to long-term bonds with an effective duration of 8.0 and short-term bonds with an effective duration of 1.0.

(a) *(3 points)* For each of i, ii, and iii, provide the allocation of long-term and short-term bonds which satisfy the stated ALM goal:

- i. Duration matching of the new SPDA's assets and liabilities
- ii. Holistic matching of the asset duration with the liability duration
- iii. Holistic minimization of the effective duration of surplus

(b) *(2 points)* Describe the limitations of each of the approaches in (a).

(c) *(4 points)* Describe other ALM and non-ALM approaches to protect Murray Life against general investment risk.

6. *(5 points)* You are the Valuation Actuary of a major U.S. Life Insurance company, which offers SPDAs and term life insurance.

(a) Describe the issues involved in applying CARVM to regular deferred annuities.

(b) Describe CARVM valuation considerations associated with the product provisions often included in SPDAs.

(c) Explain how premium deficiency reserves can arise with respect to term life insurance.

(d) Prior to Regulation XXX, explain how the Unitary method could be used to avoid having to set up a deficiency reserve for term life insurance.

7. *(4 points)* An insurance company has an S&P 500 indexed liability due in one year. The investment manager is willing to assume the risk of paying the S&P 500 indexed liability up to a maximum increase of 10%.

(a) Describe a strategy using an option to limit the insurance company's payment to a maximum S&P 500 increase of 10%.

(b) Describe a strategy using an additional option to lessen the cost of the hedging strategy in (a).

(c) Create separate graphs that show:

(i) The risk profile of the S&P 500 indexed liability

(ii) The payoff profile of the option in part (a)

(iii) The payoff profile of the additional option in part (b)

(iv) The resulting net total payoff pattern to the insurance company

Ignore option costs in the graphs. Label each graph.

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

****BEGINNING OF EXAMINATION****
FINANCE SEGMENT
AFTERNOON SESSION
Beginning With Question 8

8. *(5 points)* You are the Chief Financial Officer for Salty Life. Salty Life's core liability products are GIC contracts. Salty Life is exploring a possible purchase of the GIC business of Tugboat Life, and you have been asked to analyze the potential deal.

Tugboat Life's December 31, 2003 GIC business has the following maturity schedule:

Liability Maturity Schedule	Amount
12/31/2004	400 million
12/31/2005	600 million
12/31/2006	750 million

The GICs have no early redemption features so the maturity cashflows as shown are fixed.

Salty Life's business model utilizes the cost-of-capital approach for evaluating business opportunities. The current assumptions used in the model are:

- Risk-free rate is 4%.
- Corporate Tax Rate is 35%.
- Credit Risk Premium on Assets is 1.25%.
- Liquidity Risk Premium is 0.15%.
- Target Risk Based Capital is 5% of Assets backing both Liabilities and Surplus.
- Target return on equity for GIC business is 12%.
- Flat term structure of interest rates.
- Expenses are zero.

(a) Describe the valuation methods which can be used to determine fair value of liabilities, and indicate which would be appropriate for valuing Tugboat's GIC business.

(b) Using Salty Life's valuation model, calculate a fair value for Tugboat Life's GIC block.

9. *(15 points)* You are the Product Actuary for Get-a-Life (GAL), a life insurance company domiciled in the United States. One year ago you created a variable annuity (VA) product to replace the Equity Indexed Annuity (EIA) product that GAL was then selling.

The VA product has a fixed income option with a guaranteed minimum interest rate of 3% and an option to invest in a segregated account that is indexed to the S&P 500. The VA liabilities have a guaranteed minimum death benefit equal to the initial deposit accumulated at the guaranteed minimum interest rate.

The table below shows pricing assumptions and actual experience to date.

t	Time 0 Pricing Assumption (S_t)	Time 1 Actual and Future Re-Estimates (S_t)
0	100	100
1	105	80
2	103	89
3	112	100
4	120	110
5	135	120

In addition, you have the following information.

	Time 0 Assumption	Time 1 Assumption
${}_1p_x$	0.995	0.993
Annual Management Expense	1.5%	1.5%
Reserve Valuation Rate	4%	4%

Your sample pricing cell assumes an initial deposit of 1,000. No future deposits are allowed and the product either annuitizes or is withdrawn at the end of five years. Death is assumed to be the only decrement before the end of year five and is assumed to occur at each year-end. Management expenses are withdrawn at year-end.

(a) *(2 points)* Describe how the risk management considerations for segregated fund contracts differ from those for EIAs.

(b) *(4 points)* Calculate the reserve for your sample pricing cell at $t=1$ under the actual experience and compare it to the reserve from the original pricing assumptions.

9. **Continued**

(c) *(4 points)* Describe ways to hedge the liabilities of the VA and the practical considerations associated with each.

(d) *(2 points)* Explain the factors GAL should consider in deciding whether to hedge its VA liabilities.

(e) *(3 points)* The Chief Actuary has called a meeting to discuss first year performance of the VA product. You suspect she wants to discontinue future sales.

Outline a response which:

- supports continued sales and
- addresses any product shortcomings.

Question 10 pertains to the Case Study.

10. *(11 points)* Frank Labrador, a long-time golfing buddy of Tomas Lyons and CEO of Dog's Life Insurance Company (Dog's Life), has expressed interest in purchasing Zoolander Life. Tomas has asked you, as the new CFO of Zoolander, to come up with an actuarial appraisal value of Zoolander.

Dog's Life is an active acquirer in the life insurance market. Their actuary has informed you that their recent acquisitions have been priced using a 10% discount rate.

(a) (*6 points*) Identify the information that you have available for Zoolander that should be considered in setting actuarial and economic assumptions for use in determining an appraisal value.

(b) (*5 points*) You have calculated an appraisal value for Zoolander of 1,100.00, assuming a continuation of current operations. Justify why Dog's Life might offer a price different than the appraisal value that you calculated.

11. *(4 points)* Wayne is an evaluator. When the stock prices of Coca-Cola, Dairy Queen and Gap were depressed, he invested heavily in these companies. Other investors thought Wayne had passed his investing prime – the internet was where money was to be made. But Wayne would go to shopping malls and watch the spending habits of consumers. He saw the average person consuming the products offered by Coca-Cola, Dairy Queen and Gap, and realized that people would use these products through all economic cycles. So he bought up the stocks with the strong conviction that in the long run these firms would be profitable and their stock prices would rise.

(a) From the REMM perspective, describe how Wayne views individuals.

(b) Explain the theory behind a contrarian investment strategy, and contrast the contrarian strategy with Wayne's investment strategy.

(c) Describe each of the following behavioral concepts and determine whether each applies to Wayne:

- Overconfidence
- Non-Bayesian Forecasting
- Fashion and Fads

Support your answers.

12. *(10 points)* You are employed by a financial engineering firm. The specialty of this firm is to exploit tax arbitrage opportunities in the marketplace for high net-worth individuals and small firms in the United States.

You have been asked by the head of the firm to meet with a new client, Buffy von Bismarck, who has questions about both personal and corporate taxes. Buffy earns $200,000 a year in salary as the managing director of a small manufacturing company.

At your meeting Buffy describes the following two situations:

- "I am frustrated by paying personal taxes at a marginal tax rate of 36%. My tennis instructor told me that I could arrange it so that my current income would be maintained but my taxable income would be zero. He suggested I do the following: borrow $2,500,000 at 8% interest and invest the borrowed funds in a life insurance policy that allows interest-free policy loans and guarantees an 8% return."

- "I need to determine the correct weighting of stocks and bonds for my company's defined benefit pension plan. I know the tax code should lead me to invest in bonds, but stocks return more over a long-term holding period. Two friends told me my firm could secure the risk premiums of stock without sacrificing the tax benefits of investing in bonds."

You learn that the pension plan has $100 million in assets to invest in stocks and bonds under the following assumptions:

- The after-tax rate of return on stocks will be 10%
- The taxable rate of return on bonds will be 5%
- The marginal tax rate of the firm is 35%

(a) Demonstrate the arbitrage opportunity Buffy's tennis instructor has suggested.

(b) Evaluate the effectiveness of the arbitrage opportunity in (a). Support your answer.

(c) Demonstrate the arbitrage opportunity Buffy's friends have recommended for her pension plan.

(d) Evaluate the effectiveness of the arbitrage opportunity in (c). Support your answer.

13. *(11 points)* You are the CFO for Montague Debt Management. Montague's balance sheet currently consists of $700 million in assets financed in part by $650 million of equity. The after-tax return on assets is normally distributed with a mean of 13% and standard deviation of 7%. Assume the corporate tax rate is 30%.

Debt financing is currently provided by a single source, the Bank of Verona (BOV), at a pretax rate of 10%. BOV requires a positive return on equity (ROE) with a probability of at least 95%.

Montague is considering restructuring its capital by increasing the debt financing from BOV. R & J Capital, a regional investment bank, recently suggested to Montague's senior management that preferred stock or public debt issuance may be more attractive options than additional bank debt.

You are given the following statistics with respect to the Standard Normal Distribution:

$\Pr(X \le z)$	z
0.50	0.000
0.67	0.431
0.75	0.674
0.80	0.842
0.90	1.282
0.95	1.645
0.99	2.326

(a) (*3 points*) Determine the maximum leverage for Montague that satisfies BOV's constraints. Show all work.

(b) (*1 point*) Identify the factors that impact the debt capacity decision for Montague and for BOV as they contemplate the debt financing decision.

(c) (*2 points*) Montague's Board has asked you to differentiate public debt and preferred stock in relation to the following points:

- Priority of claim
- Control rights
- Corporate tax shields
- Tax liability for individual and corporate claim holders

Outline your reply.

13. **Continued**

(d) *(3 points)* Assume Montague has decided not to raise additional debt at this time. R & J Capital has performed an analysis of Montague's equity using the Equity Cashflow Valuation method and has determined that Montague's equity is currently overvalued. As a result, R & J Capital has recommended a public equity offering.

Identify how R & J Capital's chosen valuation method may bias their conclusion.

(e) *(2 points)* Assume the risk-free rate is 4% at all maturities and the current market price of the debt is 90%. Calculate the amount by which R & J Capital has misestimated the value of Montague's equity.

14. *(4 points)* You are the CFO for the small life insurance subsidiary of a large, publicly-traded diversified financial services organization. The subsidiary is fairly new and is growing rapidly by expanding into newer products and markets. The CEO of the life subsidiary has just told you the parent company has been acquired by a competitor. While the acquisition was friendly, the acquirer does not intend to continue operating the life subsidiary.

(a) Assume that the life subsidiary becomes a stand-alone organization. Recommend an appropriate capital structure for the life subsidiary. Support your answer.

(b) The CEO invites you to join a partnership of senior executives considering a leveraged buyout (LBO) of the life subsidiary. State the ways in which an LBO structure might improve the way the life subsidiary is run.

(c) Indicate whether an LBO is appropriate for this situation. Support your answer.

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