SOCIETY OF ACTUARIES
Exam AFE
Advanced Finance/ERM

Exam AFE

MORNING SESSION

Date: Thursday, October 30, 2008
Time: 8:30 a.m. – 11:45 a.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 120 points. It consists of a morning session (worth 60 points) and an afternoon session (worth 60 points).

   a) The morning session consists of 7 questions numbered 1 through 7.

   b) The afternoon session consists of 7 questions numbered 8 through 14.

   The points for each question are indicated at the beginning of the question. Questions 1 - 4 pertain to the Case Study, which is enclosed inside the front cover of this exam booklet.

2. Failure to stop writing after time is called will result in the disqualification of your answers or further disciplinary action.

3. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions on the exam booklet.

Written-Answer Instructions

1. Write your candidate number at the top of each sheet. Your name must not appear.

2. Write on only one side of a sheet. Start each question on a fresh sheet. On each sheet, write the number of the question that you are answering. Do not answer more than one question on a single sheet.

3. The answer should be confined to the question as set.

4. When you are asked to calculate, show all your work including any applicable formulas.

5. When you finish, insert all your written-answer sheets into the Essay Answer Envelope. Be sure to hand in all your answer sheets since they cannot be accepted later. Seal the envelope and write your candidate number in the space provided on the outside of the envelope. Check the appropriate box to indicate morning or afternoon session for Exam AFE.

6. Be sure your written-answer envelope is signed because if it is not, your examination will not be graded.

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Exam AFE-Front Cover

****BEGINNING OF EXAMINATION****
ADVANCED FINANCE AND ENTERPRISE RISK MANAGEMENT
Morning Session

Questions 1 – 4 pertain to the Case Study.
Each question should be answered independently.

1. (*4 points*) You are a management consultant hired by Zoolander to assess the Operational Risk attributable to the BingBang project.

Assuming that system implementation will be outsourced, use the Risk Assessment Framework below to analyze the operational risks of the computer systems aspect of the BingBang project.

(i) Identify and explain three separate operational risk exposures.
(ii) Categorize these operational risk exposures as either internal or external dependencies. If internal, further categorize as people, process or technology related.
(iii) Qualitatively categorize the probability of incidence and justify your assessment.
(iv) Qualitatively categorize the severity of the risk exposure and justify your assessment.

Operational Risk Exposures	Operational Risk Categories				Probability (High, Med, or Low)	Severity (High, Med, or Low)
	Internal Dependencies			External Dependencies		
	People	Process	Technology			

Questions 1 – 4 pertain to the Case Study.
Each question should be answered independently.

2. (*7 Points*) Bill Buck has reviewed Sam Otter's term projections and he is concerned about the aggressive pricing for the term block. He has decided to apply the Enterprise Risk management (ERM) risk control process to this block.

In order to make the scope of this task more manageable, he had decided to focus on risks affecting significant line items on the term block income statement projection. He defined significant line items as those projected to be greater than $100 million in 2008.

(a) (*1 point*) Describe the eight steps of the ERM risk control process, in general.

(b) (*3 points*) Apply the ERM risk control process to the existing business of Zoolander's term block and explain the results.

(c) (*3 points*) Recommend future steps for Zoolander to better handle the risks that are based on any specific shortcomings illustrated in this assessment.

Questions 1 – 4 pertain to the Case Study.
Each question should be answered independently.

3. (*19 points*) As part of the new VA Plus product line, you are considering the addition of a GMMB to a single premium deferred variable annuity contract offered by Zoolander. The guarantee being considered would provide a minimum maturity benefit equal to 100% of the premium deposited for all funds invested in the Zoo Balanced Fund. The contract maturity is in 10 years.

You are provided with the following items:

$$P_0 = Ge^{-rT}\Phi\left(-d_2\right) - S_0(1-m)^T\Phi\left(-d_1\right)$$

$$d_1 = \frac{\log\left(S_0(1-m)^T / G\right) + \left(r + \sigma^2/2\right)T}{\sigma\sqrt{T}}$$

$$d_2 = d_1 - \sigma\sqrt{T}$$

$$S_0 = F_0 = 100$$

- The risk free rate of return is 6% per annum
- Combined annual mortality and lapse is assumed to be a constant 5% per annum.

You are given the following normal distribution values:

x	$\Phi(x)$	$\Phi(-x)$
0.15	0.5596	0.4404
0.32	0.6255	0.3745
0.45	0.6736	0.3264
0.59	0.7224	0.2776
0.78	0.7823	0.2177
0.92	0.8212	0.1788

(a) (*1 point*) In the email trail between Danielle Wolfe and Wanda Foxx, Wanda suggests that ALM testing might be appropriate for the VA Plus products while Danielle suggests otherwise.

Explain whether you think ALM testing is appropriate for these products. Justify your response.

Question 3 continued on next page

Questions 1 – 4 pertain to the Case Study.
Each question should be answered independently.

3. Continued

(b) (*3 points*) Wanda Foxx's email dated September 26, 2008 states that ALM risk can be managed using more than just investment strategies.

(i) Define three non-investment strategies available to Zoolander for managing the ALM risk associated with the VA Plus products.
(ii) For each of these strategies, provide examples of how it could be used by Zoolander to mitigate the ALM risk for these products.

(c) (*1 point*) Zoolander has decided to manage the risks associated with the VA Plus products using a dynamic hedging program. Wanda Foxx has computed the cost of offering these benefits using a Black-Scholes approach and as a result, recommends limiting the mutual funds for which the VA Plus features will be offered.

Explain why Wanda might make such a recommendation.

(d) (*3 points*) Compute the value of the GMMB replicating portfolio using the formula provided above and assuming all funds are invested in the Zoo Balanced Fund. Show your work.

(e) (*4 points*) For each of the Greeks below,

Delta	-0.10295
Gamma	0.00283
Vega	56.68582
Theta	0.30096
Rho	-144.63635

(i) Describe the impact on the value of the GMMB for a change in the corresponding financial variable.
(ii) Describe how the exposure measured by each Greek can be hedged.

Question 3 continued on next page

Questions 1 – 4 pertain to the Case Study.
Each question should be answered independently.

3. Continued

(f) (*4 points*) For each of the changes listed below, describe the effect that each of these would have on the value of the replicating portfolio. Provide a conceptual explanation of why such an effect would occur.

(i) An increase in the fund management fee for the Zoo Balance Fund from 3% to 5%.
(ii) A change to the GMMB to provide a minimum maturity benefit equal to 90% of the premium deposited.
(iii) A decrease in the contract maturity from 10 years to 5 years.
(iv) A decrease in the risk free rate from 6% to 2%.
(v) A decrease in the combined mortality and lapse rate from 5% per annum to 3% per annum.
(vi) An increase in volatility from 20% to 25%.

(g) (*3 points*) Identify four components that Zoolander should incorporate in its processes to achieve "best practices" in Asset/Liability Management. Explain the benefits of incorporating these components into practice. Comment on whether, based on the case study information, Zoolander has or has not implemented these components.

Questions 1 – 4 pertain to the Case Study.
Each question should be answered independently.

4. (*9 Points*) Zoolander is presented with the following investment opportunity, "Project Zebra", which involves the purchase of a block of business during 2008. Zoolander intends to raise the necessary $1,000 million purchase price entirely through debt, at 5% interest, after tax, which reflects prevailing credit market rates for Zoolander's current financial condition. None of this debt would be paid down during 2008.

At the end of 2008, there is a probability of

- 1/3 that Project Zebra will result in an after-tax loss of $1,050 million;
- 1/3 that Project Zebra will result in an after-tax gain of $750 million;
- 1/3 that Project Zebra will result in an after-tax gain of $1,500 million.

Zoolander has also been presented with an opportunity to hedge the uncertain Project Zebra results. The hedge will yield the project's expected value with certainty for a cost of $25 million.

In completing your analysis, assume the following:

- 5% growth in 2008 over 2007 distributable earnings for Zoolander's existing business, one third of which will be paid out as cash dividends to shareholders during the year.
- Bankruptcy costs will be $100 million, if applicable.

(a) (*5 points*) Calculate the expected value of both equity and debt stakeholders at December 31, 2008, assuming Zoolander invests in Project Zebra, for

(i) the hedged scenario, and
(ii) the non-hedged scenario.

Show your work.

(b) (*1 point*) Explain whether shareholders would prefer to take on this project or not, and, if so, whether they would choose to hedge or not, based purely on their financial perspective.

(c) (*1 point*) Explain the rational viewpoint of the potential bondholders toward this transaction and the ramifications if Zoolander is able to convince the bondholders that a hedging strategy will be used.

(d) (*2 points*) Explain the ramifications of Zoolander instead using retained earnings for all or most of the capital requirements for Project Zebra, rather than issuing new debt, with respect to both the hedged and unhedged scenarios.

5. (*4 points*) You are the Chief Financial Officer of Great Big Insurance Company, a publicly held U.S. insurance company. Great Big is considering increasing its dividends to shareholders.

Great Big has historically used Earnings Per Share (EPS) to measure value. You have suggested using Economic Value Added (EVA) to determine value instead.

(a) Describe how EVA is determined and explain the principal aims of EVA measurement.

(b) With respect to dividends:

(i) Explain the considerations that enter into the decision of whether or not to increase dividends to shareholders.
(ii) Explain the impact on the EVA calculation if dividends are increased.

(c) Describe deficiencies in the current EPS measurement approach.

6. (*11 points*) You are conducting a risk assessment of the various current product offerings of EZ Life Insurance (EZL). EZL is currently offering or developing the following product lines:

- Individual and Group Annually Renewable Term Insurance: a longstanding core product line with a substantial block of Group Insurance with particular success in the High-Tech affinity groups. EZL has YRT reinsurance treaties with BigRe covering these products. As a way to better control mortality risk, the company is considering revising its underwriting process by introducing new risk classes.

- The Universal Life (UL) product is being revamped with a death-benefit focus. The new UL is to provide a secondary guarantee and a maturity extension to remain competitive. EZL also intends to offer a Long-Term Care Insurance (LTCI) rider in combination with their UL product to increase market share.

- EZL is currently repricing its Variable Annuity (VA) product and adding additional guaranteed minimum benefits in order to at least maintain market share in this highly competitive market segment.

- EZL is not changing its Equity-Indexed Annuity (EIA) this year. EZL hedges this block with a combination of fixed instruments and equity options whose payoff will match that of the EIA product at the time of maturity.

(a) (*1 point*) Explain the considerations in the selection of risk characteristics and risk classes under Actuarial Standard of Practice 12.

(b) (*2 points*) Compare the potential severity of a modern day pandemic to the 1918 Spanish Flu.

(c) (*1 point*) Explain how EZL's term block exposes EZL to pandemic risk and identify options for EZL to control exposure to this risk.

(d) (*2 points*) For the new UL product:

(i) Identify the two structures that EZL may have used to provide secondary guarantees and the advantages and disadvantages of each.
(ii) Identify three product development challenges that EZL is facing in developing a death-benefit focused UL.
(iii) Identify four considerations in the pricing of LTCI accelerated death benefit riders to Universal Life plans.

Question 6 continued on next page

6. Continued

(e) (*3 points*) EZL has produced the following data with respect to the repricing of the VA product:

RBC C3 Component	Fee Level					
Asset Allocation Strategies:	**10 bps**	**15 bps**	**20 bps**	**25 bps**	**30 bps**	**35 bps**
Conservative	1.31%	0.78%	0.13%	0.06%	0.02%	0.01%
Moderate Conservative	1.79%	1.32%	0.81%	0.27%	0.19%	0.11%
Moderate	2.93%	1.78%	1.30%	0.93%	0.44%	0.27%
Moderate Aggressive	4.01%	2.94%	1.77%	1.32%	1.01%	0.62%
Aggressive	5.56%	4.24%	2.91%	1.79%	1.55%	1.29%

(i) Explain the policyholder behavior risk present in EZ's VA product.
(ii) Recommend a fee structure for EZ's new VA to control policyholder behavior risk.
(iii) Identify the potential concern with this fee structure.

(f) (*2 points*) With respect to EZL's new EIA product:
(i) Identify the "missing risk" in the pricing of EIAs that EZL should consider in its new product.
(ii) Calculate the exposure after one year of the new EIA to this risk assuming:

- $100,000 premium
- 5-year term to maturity
- 3% guaranteed interest per year on 90% of premium
- Participation rate: 60% of S&P Index
- 5% Sales Commission
- Early Withdrawals permitted at Minimum Guaranteed Value
- Risk-free rate is 4%
- There has been no change in the equity market after one year
- Fixed rates have risen 3% after one year

Show your work.

7. (*6 points*) Your company, ABC Insurance Company, is a regional variable annuity writer that would like to expand. You have been told that a fixed annuity writer QRS may be up for sale. The CFO has asked you to lead the evaluation of this possible acquisition.

(a) Describe the benefits and risks to ABC of the potential acquisition.

(b) Describe the types of sales processes that QRS might utilize to execute its sale.

(c) Explain the steps that you should take to evaluate this acquisition.

(d) Compare and contrast surplus notes and equity offerings as financing instruments for this acquisition.

(e) Identify the types of synergies that can occur from an acquisition, and explain whether each of these synergies is likely to be realized in this situation.

****END OF EXAMINATION****
Morning Session

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Exam AFE

AFTERNOON SESSION

Date: Thursday, October 30, 2008
Time: 1:30 p.m. – 4:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 7 questions numbered 8 through 14 for a total of 60 points. The points for each question are indicated at the beginning of the question. There are no questions that pertain to the Case Study in the afternoon session.

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****BEGINNING OF EXAMINATION****
ADVANCED FINANCE AND ENTERPRISE RISK MANAGEMENT
Afternoon Session

8. (*7 Points*) You are the Enterprise Risk Manager for West Coast Bank. The CFO would like to take steps toward Integrated Risk Management. He has assigned you the task of outlining the theory and laying out the framework for implementation.

Currently there is a Board Committee that approves the amount of risk that the bank is willing to take and then delegates authority to the Chief Risk Officer. The Chief Risk Officer interacts with the Business Managers.

West Coast Bank has three business units: Alpha, Beta, and Gamma. In an effort to establish risk limits for liquidity management, the CFO would like to begin charging each business for the liquidity risk it generates.

You are given the following data:

Type of Liquidity Supplier	Supplier Rank Score	User Rank Score
Low	1	-1
Medium Low	2	-2
Medium	3	-3
Medium High	4	-4
High	5	-5

Business Unit	Liquidity Used	Liquidity Supplied
Alpha	\$4M low	\$8M high
	\$8M high	
Beta	\$2M high	\$0.50M low
		\$1.75M high
Gamma	\$10M low	\$3M medium low
		\$2M medium high

(a) Define integrated goal-congruent risk management.

(b) Outline a suggested risk management framework to present to your CFO using the three-pillar framework.

Question 8 continued on next page

8. Continued

(c) Recommend changes to the current roles and reporting structure in West Coast Bank to move the Bank to an ideal integrated risk management framework.

(d) For each business unit, a business unit mandate is required.

Explain why this is essential and describe what steps you would take to obtain approval of a business unit mandate.

(e) Calculate the liquidity rank of each business unit.

9. (*16 Points*) Last year, Omega Life decided to expand beyond its life insurance products and begin offering 1-year and 2-year GICs as a pilot project. The pilot was designed as a one-year learning experience to assess the viability of offering a full complement of GIC products.

After one year, detailed research into the GIC market was to be completed and an analysis of the profitability of the one-year pilot based on Omega's new Total Return economic approach was to be performed.

The current investment staff had capacity to manage the assets of the pilot, but any substantial increase in volume of new business would require either an increase in in-house investment management staff or outsourcing of the investment management function. For the one-year pilot, investment management followed a conservative, immunized approach.

Omega is now ready to decide among the following alternatives:

- Launch with an expanded GIC product suite of term offerings,
- Launch with a more limited range of GIC offerings,
- Exit the GIC product line altogether.

The following data is available at the end of the one-year pilot project:

Risk-free rate	3.00%
Investment expenses	0.10%
Liability expenses	0.20%
OAS	0.60%
ΔOAS	0.00
Required OAS (ROAS) at t=0	0.50%
Rich/cheap rate (r/c) =	0.20%
Portfolio adjustment return (pa) =	0.00

Key Rate Duration (KRD)	**Assets**	**Liabs**	$\Delta r(i)$
D(1)	0.6	0.5	-0.50%
D(2)	1.1	0.9	-0.25%

The market research report has gathered the following information:

- The NPV of the project is 100.
- The project can go up by a factor of 130% or down by 80%.
- Expansion costs $30 but increases value of project by 30%.
- Abandonment value is $90.

Question 9 continued on next page

9. Continued

(a) (*1 point*) Describe the four steps to the Total Return approach that Omega will use for analyzing the GIC assets and liabilities on a consistent basis.

(b) (*2 points*) Assuming zero surplus, calculate the total return on the portfolio compared to the total required return on the GIC liabilities. Show your work.

(c) (*2 points*) Calculate the attribution of the Net Profit under the Total Return approach to its various components. Show your work.

(d) (*1 point*) Assess the performance of the 1-year GIC pilot project on a Total Return basis.

(e) (*2 points*) Explain five real options available to management at any point for the GIC initiative and identify the corresponding financial market product equivalents that may be used to value each of them.

(f) (*5 points*) Calculate independently the value of each of the following real options that Omega has, using a two-year Binomial tree approach:

(i) abandonment option;
(ii) expansion option.

Show your work.

(g) (*3 points*) Calculate the value to Omega of the two real options in (f) on a combined basis for the GIC project, using a two-year Binomial tree approach. Show your work.

10. (*6 points*) You are the appointed actuary for ABC Life Co., a Canadian company that sells variable annuities. You have decided to use a stochastic lognormal model to value the guarantees embedded in these products.

The calibration table of maximum acceptable quantiles established by the CIA (2000) Task Force is:

Accumulation period	Percentile		
	2.5^{th}	5^{th}	10^{th}
1-year	0.76	0.82	0.90
5-year	0.75	0.85	1.05
10-year	0.85	1.05	1.35

In addition, calibration requirements state that the mean of the one-year accumulation factor must lie in the range of 1.10 to 1.12, and the standard deviation of the one-year accumulation factor should be at least 0.175.

You are given the following values from the standard normal distribution,

$$\Phi(-1.96) = 2.5\%$$
$$\Phi(-1.645) = 5\%$$
$$\Phi(-1.28) = 10\%$$

(a) Outline the required calibration procedure if it is decided that the model parameters should reflect historical data up to September 2008.

(b) Calculate lognormal model parameters μ and σ (annualized) using the 1-year 2.5^{th} and 10^{th} percentiles. Show your work.

(c) Identify the drawbacks of the approach used in (b) and propose a better approach to calibrate the lognormal model.

(d) A consultant recommends that a stochastic volatility model be used as this model provides a fatter tail distribution than the log-normal model. As there is no closed-form formula for the percentiles, you determine that calibration must be done by the simulation method, and you recall that the CIA calibration stipulates that the fitted values must be adequate with a 95% probability.

Determine if the calibration criteria for the 2.5^{th} percentile of the one-year accumulation factor is met, given that for 50,000 stochastic simulations, 1,312 give values of the one-year accumulation factor lower than 0.76.

11. (*11 points*) Your company, Diversified Financial Services (DFS) has just adopted an internal economic capital approach to managing risk. DFS's old approach to managing credit risk involved applying an internal ratings process and deriving an internal capital charge equal to four times the sum of the VaR at the 99.5% confidence level for spread risk, downgrade risk and default risk over a 1-year horizon. This factor approach has been replaced with a sophisticated credit risk model that uses a risk-neutral valuation approach.

You are currently assessing the credit impact to your portfolio of the purchase of a 2-year, 5% annual coupon TechNix corporate bond that was purchased at 100.05. This split-rated bond has an A3 rating from Moody's and a BBB+ rating from S&P. DFS has not invested in TechNix before, and has limited exposure to the technology sector overall.

To assess the credit risk of the potential TechNix bond acquisition, you have gathered the following information:

- Moody's most recent study has produced the following 1-year transition matrix:

Initial Rating	Rating at Year-end (%)							
	Aaa	Aa	A	Baa	Ba	B	Caa	Default
Aaa	90.80	8.30	0.70	0.07	0.13	0.00	0.00	0.00
Aa	0.70	90.70	7.80	0.60	0.06	0.14	0.00	0.00
A	0.09	2.30	91.00	5.50	0.75	0.30	0.01	0.05
Baa	0.02	0.30	5.90	87.00	5.30	1.20	0.10	0.18
Ba	0.03	0.15	0.65	7.75	80.55	8.80	1.00	1.07
B	0.00	0.10	0.25	0.45	6.45	83.45	4.05	5.25
Caa	0.25	0.00	0.20	1.30	2.35	11.25	64.85	19.80

- You have derived the following one-year forward zero curves (%) for various credit ratings:

Category	Year 1	Year 2
AA	3.65	4.20
A	3.70	4.30
BBB	4.10	4.70
BB	5.60	6.00

Question 11 continued on next page

11. Continued

- Your internal credit risk model indicates the following values associated with each credit rating as follows:

Year (t)	Q_t^A	Q_t^{BBB}	LGD^A	LGD^{BBB}
1	2.0%	3.0%	40%	50%
2	15.0%	18.0%	40%	50%

  where Q_t is the risk-neutral expected default frequency at the horizon t.

- The risk-free rate is 3%.

- Recall: $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

(a) (*1 point*) Identify possible shortcomings with DSF's old internal economic capital approach to credit risk.

(b) (*1 point*) Define the four elements of credit risk according to the AAA Report to the NAIC on risk mapping and assess DFS's exposure to each in its purchase of the TechNix bond.

(c) (*2 points*) Interpret the meaning behind each of Moody's and S&P's ratings of TechNix's 2-year issue. Suggest possible explanations for the difference in ratings from the two agencies.

Question 11 continued on next page

11. Continued

(d) (*3 points*) Complete the following table with respect to the expected value of the TechNix bond in one year, using Moody's initial rating.

Year-End Rating	Probability of State: $p(\%)$	1-Year Forward Price: $V(\$)$	Change in Value: $\Delta V(\$)$
AAA		106.35	
AA			
A			
BBB			
BB			
B		103.96	
CCC		96.30	
Default		50.00	

Show your work.

(e) (*4 points*) Using the risk-neutral valuation approach of your credit risk model:

(i) Calculate TechNix's credit spread under each of Moody's and S&P's ratings.
(ii) Determine which rating is more consistent with the market.

Show your work.

12. (*7 points*) Your company is considering three major projects as part of the strategic growth plan, of which it can only undertake one because of the significant initial required capital outlay. None of these projects involves managerial flexibility.

In the past, your company has used the IRR method exclusively to select projects.

The following table provides the cash flows for these projects.

	Pre-tax Cash Flows		
Year	Project A	Project B	Project C
0	−2,000	−1,200	−1,500
1	1,400	800	1,600
2	800	200	400
3	200	150	−600
4	100	400	400

You are given the following information:

- Tax Rate is 35%
- Cost of Capital is 12%
- Pre-tax cash flows are equal to pre-tax accounting income

You have calculated the following IRRs for these projects

	Project A	Project B	Project C
IRR	15%	14%	17%

You have been asked to prepare a presentation for the 5-year Planning committee as to how your company determines which projects maximize shareholder value.

(a) Compare and contrast economic profit and accounting profit.

(b) Explain the objective of capital budgeting techniques and the criteria that any appropriate capital budgeting technique should satisfy.

(c) Besides the IRR method, identify and describe three other widely-used techniques used to analyze projects with cash flow certainty for capital budgeting purposes, including their shortcomings. Explain how to calculate IRR and the three other measures you have identified.

(d) Show the calculations for each of the three methods you identified in (b) above, for each of Projects A, B, and C.

Question 12 continued on next page

12. Continued

(e) Recommend which project, if any, should be undertaken from a shareholder value perspective. Justify your recommendation.

(f) If any of the four capital budgeting techniques you evaluated above lead to different optimal projects, describe why you did not use those results as the criteria for your recommendation in (d).

13. (*8 points*) You are the Chief Risk Officer (CRO) of Stakeholder Property and Casualty Insurance Company ("SP&C"). SP&C is a major writer of P&C business in Florida and hence is exposed to natural catastrophes.

Your risk department has provided you with the following information for SP&C:

Risk Element	Amount	Capital Ratio
Stocks	200	0.20
Bonds	1000	0.05
Affiliates	100	0.20
Loss Reserves	800	0.10
Property UPR	100	0.20

Correlated Risk Elements		Correlation Coefficient
Stocks	Bonds	0.2
Stocks	Affiliates	1.0
Bonds	Affiliates	0.2
Bonds	Loss Reserve	0.3
Affiliates	Loss Reserve	−1.0

SP&C currently has a catastrophe Stop-Loss reinsurance arrangement in place.

(a) (*1 point*) The estimated Loss Reserves have elements of "Reserve Risk". Define this risk and identify the factors that affect it.

(b) (*1 point*) The Capital Ratio for SP&C's Loss Reserves is based on the Expected Policyholder Deficit (EPD) metric. Loss Reserves are assumed to follow a one-year binomial stochastic process, such that they will either increase by 20% or decrease by 20% over the next year, with equal probability.

Show how the 10% Capital Ratio given above was derived using an EPD ratio of 0.05.

(c) (*4 points*) You wish to assess the impact of correlation effects on SP&C's amount of RBC.

Calculate the RBC levels that result assuming that the risk elements are:

(i) perfectly positively correlated instead of having the correlations shown in the table
(ii) totally uncorrelated instead of having the correlations shown in the table
(iii) correlated as shown in the table and have zero correlation in all other cases.

Show your work.

Question 13 continued on next page

13. **Continued**

(d) (*2 points*) SP&C is considering hedging some of its catastrophic risk exposures to Florida through the purchase of Florida State index-based catastrophe options that trade on the Chicago Board of Trade.

Compare and contrast SP&C's existing reinsurance program against this alternative hedge with respect to each of the following:

(i) Credit risk
(ii) Basis risk
(iii) Moral hazard

14. (*5 points*) A U.S. based company is planning to introduce a 10-year equity-indexed annuity (EIA) product with annual resets. You have been asked to provide advice on the hedge accounting implications under FAS 133.

(a) Contrast the accounting treatment for hedge instruments that qualify as fair value hedges with that of hedge instruments that qualify as cash flow hedges.

(b) Identify the elements which should be part of the formal documentation of the hedge at its inception.

(c) Outline the disclosure requirements that must be satisfied in order to utilize FAS 133.

(d) Describe the accounting treatment of the embedded derivative in the EIA product, assuming FAS 133 applies.

(e) Explain how the EIA could be designed to avoid having it subject to FAS 133.

****END OF EXAMINATION****
Afternoon Session