SOCIETY OF ACTUARIES
Life Pricing

Exam ILALP

AFTERNOON SESSION

Date: Tuesday, October 28, 2014
Time: 1:30 p.m. – 3:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 5 questions numbered 8 through 12 for a total of 40 points. The points for each question are indicated at the beginning of the question.
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 because 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 ILALP.
6. Be sure your written-answer envelope is signed because if it is not, your examination will not be graded.

Tournez le cahier d'examen pour la version française.

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Exam ILALP-Front Cover

****BEGINNING OF EXAMINATION****
Afternoon Session
Beginning with Question 8

8. (*7 points*) You are the illustration actuary for ABC Company and have created the following certification to comply with the NAIC Life Insurance Illustrations Model Regulation:

> *To: Chief Actuary of ABC Company and Insurance Commissioner in the state of Texas*
>
> *I am an officer of ABC Company and member of the American Academy of Actuaries in good standing. I was appointed by the Board of Directors of said insurer to be the illustration actuary for all plans of insurance subject to the Life Insurance Illustrations Regulations for this state.*
>
> *Scales used in illustrating non-guaranteed elements for the plans of insurance described above meet the requirements of the Regulation. The disciplined current scales for this plan are in conformity with ASOP 24 promulgated by the Actuarial Standards Board. Moreover:*
>
> - *No currently payable scale for business issued within the last 5 years and within the scope of this certification has been reduced for reasons other than changes in the experience factors underlying the disciplined current scale.*
> - *Illustrated non-guaranteed elements for new and in-force polices subject to this regulation are consistent with the non-guaranteed element amounts actually credited or charged to the same or similar forms.*
> - *The minimum expenses used in the calculation of the disciplined current scale for all policy forms subject to this regulation were fully allocated and this expense information was provided to the agents.*
> - *Illustration formats used by ABC Company meet the requirements of this regulation.*

(a) (*4 points*) Critique the memo above with respect to the NAIC Life Insurance Illustrations Model Regulation.

(b) (*3 points*) Your marketing department does not want to provide an illustration for an illustrated policy form at time of sale. Describe alternative solutions in order for your company to comply with this request.

9. (*7 points*) You are developing stochastic risk-free rates for a Variable Annuity Guaranteed Minimum Accumulation Benefit (GMAB) which can be exercised 10 years after issue. A basic economic scenario generator is being used to model realistic yield curve dynamics.

You are given for a particular scenario:

- The bootstrapping method is used to determine continuously compounded spot rates
- Expected drift in interest rates is ignored
- Annual government interest rates

	Annual Par Yield Rates
1 Year	2.00%
2 Year	2.50%
3 Year	3.50%

- Results of a two-factor principal component analysis (PCA)

	Factor 1	Factor 2
1 Year	0.66%	-0.10%
2 Year	0.87%	0.08%
3 Year	1.09%	0.27%

- Normal distribution random numbers generated

	Factor 1	Factor 2
Year 1	-1.5988	-0.7991
Year 2	0.9673	-0.9475

- The Forward Rate F for the period between T_i and T_j, measured in years, is $F = \left[T_j * S\left(0, T_j\right) - T_i * S\left(0, T_i\right)\right] / \left[T_j - T_i\right]$, where $S(0, T)$ is the spot rate for maturity of T years

(a) (*4 points*) Calculate $F_1(1)$ and $F_2(2)$, where $F_t\left(t+T\right)$ is the time t rate T years forward, and $T = 0$ for both.

(b) (*3 points*) Describe other methodologies in calculating stochastic risk-free rates for the GMAB.

10. (*11 points*) AMD Company would like to offer a fully underwritten Critical Illness (CI) Term 10 to Age 75 product.

You are given the following assumptions from AMD's fully underwritten term life insurance block and from AMD's Critical Illness incidence rate table:

- The normal mortality rate is 4.0 per 1,000 with a normal lapse rate of 5% per year
- Newly underwritten insureds have a select mortality rate of 1.0 per 1,000
- The expected lapse rate is 20%
- 40% of the extra lapses are assumed to be selective
- The normal incidence rate is 14.0 per 1,000
- Assume preservation of total deaths

(a) (*3 points*) AMD has no credible data on how incidence rates will deteriorate after the selective lapses at duration 10. AMD decides to use a mortality table to derive the incidence assumption.

Calculate the deteriorated incidence rate of the remaining inforce policies using mortality deterioration as a reference. Show all work.

(b) (*2 points*) Rather than using mortality, AMD decides to use their incidence rate table for the selective lapse calculation. The results produce point-in-scale incidence rates that are lower than the newly selected rates for the same attained age in some cases.

Explain the implications for the incidence deterioration calculation using preservation of total "incidents" and the rate of selective lapsation.

(c) (*6 points*) Compare how the persistency and morbidity assumptions of the CI product may be affected if they were sold through:

- AMD's life and property and casualty insurance career sales force
- Independent agents who only sell CI
- A direct marketing strategy targeting tech-savvy young adults and students through internet advertising and an online application

11. (*10 points*) CBS Company would like to offer a fully medically underwritten Critical Illness (CI) product as well as a simplified issue CI product that uses a predictive underwriting model. No other companies currently offer a simplified issue CI product in CBS's market.

(a) (*3 points*) Describe advantages of:

(i) A simplified issue CI product.

(ii) A predictive underwriting model.

(b) (*7 points*) You are given:

- Each product has a 10 year stepped premium structure (premiums increase every 10 years from issue)
- Both products cover cancer, heart attack, stroke, and bypass surgery
- Each product provides coverage to age 75
- The simplified issue product has a higher premium than the fully underwritten product
- The issue limits for the simplified issue product are 50,000 to 250,000
- The issue limits for the fully underwritten product are 100,000 to 2,000,000

(i) (*3 points*) Compare the factors impacting the persistency and morbidity assumptions of both CI products assuming that the factors from life insurance persistency studies apply to CI.

(ii) (*4 points*) Propose changes that CBS could make to improve the morbidity for its simplified issue product.

12. (*5 points*) For a non-renewable 5-year term life insurance block, you are given:

- Level premiums are 7 per 1,000 of inforce face amount
- Annual maintenance expenses are 0.10 per 1,000 of inforce face amount
- Acquisition expenses are 8 per 1,000 of face amount
- The face amount inforce at time 0 is 1,000,000

Duration	0	1	2	3	4	5
Claims		3,000	4,500	3,500	4,000	4,500
Solvency Reserves	15,000	25,000	20,000	10,000	5,000	0
Required Capital	8,000	10,000	10,000	5,000	3,000	0

Assume:

- No lapses
- An annual investment rate of 2.5%
- An annual discount rate of 3.0%
- Premiums and expenses at the beginning of the year
- All other cash flows occur at the end of year
- No taxes

Calculate the present value of profit as a % of premium using distributable earnings as the profit measure. Show all work.

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

USE THIS PAGE FOR YOUR SCRATCH WORK