INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

30th October 2014

Subject ST7 – General Insurance: Reserving & Capital Modeling

Time allowed: Three Hours (14.45* – 18.00 Hrs)

Total Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. *Please read the instructions on the front page of answer booklet and instructions to examinees sent along with hall ticket carefully and follow without exception.*
2. ** You have 15 minutes at the start of the examination in which you are required to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You have then three hours to complete the paper.*
3. *You must not start writing your answers in the answer sheet unless instructed to do so by the supervisor.*
4. *The answers are not expected to be any country or jurisdication specific. However, if Examples/illustrations are required for any answer, the country or jurisdiction from which they are drawn should be mentioned.*
5. *Attempt all questions, beginning your answer to each question on a separate sheet.*
6. *Mark allocations are shown in brackets.*
7. *Please check if you have received complete Question paper and no page is missing. If so, kindly get a new set of Question paper from the Invigilator.*

Q. 1)   Given the following information regarding a casualty excess-of-loss treaty

- Treaty Effective Date   January 1st, 2013
- Treaty Expiration Date   December 31st, 2013

Primary Company Loss Experience

Claim No.	Policy Effective date	Policy Type	Date of loss	Loss to Treaty (INR Lacs)
1	01-11-2012	New	23-06-2013	50
2	01-12-2012	Renewal	17-12-2012	200
3	15-12-2012	Renewal	08-02-2013	220
4	01-01-2013	New	10-04-2013	65
5	01-01-2013	Renewal	04-03-2013	120
6	15-02-2013	New	16-06-2013	400
7	01-04-2013	New	12-08-2013	185
8	01-06-2013	New	25-09-2013	90

i)   Calculate the losses covered by the treaty, assuming the treaty is written on a *risk attaching* basis. Include the definition for *risk attaching basis* in your answer   (2)

ii)   Calculate the losses covered by the treaty, assuming the treaty is written on a *losses occurring* basis. Include the definition for *losses occurring basis* in your answer.   (2)

iii)   Calculate the losses covered by the treaty, assuming the treaty is written on an *in-force policies* basis. Include the definition for *in-force policies basis* in your answer.   (2)

[6]

Q. 2)   You are given the following information:

(all figures are in INR crore)

Ceding company balance sheet items before quota share agreement

Assets	180
Unearned premium reserve	120
Policyholders' surplus	60

Reinsurance company balance sheet items before quota share agreement

Assets	300
Unearned premium reserve	220
Policyholders' surplus	80

- Assume the ceding company wants to cede 80 crores of its unearned premium reserve through a quota share agreement.

- Assume a 25% ceding commission.
- Assume the reinsurance company is solvent and authorized

i) Using statutory accounting, show the new balances for assets, unearned premium reserves, and policyholders' surplus, for the ceding company and for the reinsurer. (3)

ii) What is a disadvantage to the ceding company of entering into the quota share agreement described above? (1)

[4]

Q. 3) What are the reasons that cause longer reporting delays and settlement delays for liability insurance? **[6]**

Q. 4) Discuss, briefly, the various insurance needs of a medium-sized fast food restaurant chain. **[8]**

Q. 5) Given the following information:

Cumulative Paid Loss (Crores)

Accident Year	<u>12 Months</u>	24 Months	36 Months	48 Months
2010	75	212.5	288	337
2011	50	165	310	
2012	115	238		
2013	85			

Case Outstanding (Crores)

Accident Year	<u>12 Months</u>	24 Months	36 Months	<u>48 Months</u>
2010	188	115	74	35
2011	175	94	45	
2012	115	238		
2013	208			

i) Calculate reported claims for accident year 2011 as of December 31st, 2013 (2)

ii) Calculate paid claims for calendar year 2013 (2)

iii) Calculate change in case reserves for calendar year 2013 (2)

iv) Briefly describe two benefits of organizing data for reserving on an accident year basis (2)

During the analysis, you have noticed higher-than-expected reported and paid losses in accident year 2012. You have also been informed by claims department that all high-severity claims reported on or after January 1st, 2012 have been handled by a newly established office that specializes in such claims. Compared to the prior claim office, this new office establishes higher initial case reserves and settles claims more promptly.

v) Explain the effect that the new claims-handling procedure will have on the liability estimate produced by the unadjusted reported loss development method. (2)

vi) Explain the effect that the new claims-handling procedure will have on the liability estimate produced by the unadjusted paid loss development method (2)

vii) Suppose, instead, that there had been no changes in the claims handling, but the actuary still observes higher-than-expected reported and paid losses in accident year 2012. What two questions that you might ask the underwriting manager to help identify the source of the change in the loss data? (2)

[14]

Q. 6) You have been provided the following information about a medium-tailed line of business of a general insurance company:

Year 200X-X+1 indicates 1ˢᵗ Apr 200X to 31ˢᵗ Mar 20X+1

Accident Year	Cumulative Paid Losses (000)			
	Age of development in months			
	12	24	36	48
2009-10	270,000	490,000	650,000	720,000
2010-11	280,000	570,000	710,000	
2011-12	330,000	650,000		
2012-13	350,000			

Interval	Selected Age to Age Loss Development Factors
12-24 months	2.00
24-36 months	1.20
36-48 months	1.15
48- Ultimate	1.00

Claims are paid evenly throughout the year
Interest rate = 6.0% pa

i) Calculate the ratio of discounted reserves to undiscounted reserves as of 31ˢᵗ March 2013. (3)

When compiling data in preparation for a reserve analysis, the actuary must consider changes in the external environment as well as changes internal to the insurance company. For each of b, c, d and e below, give an example of a situation in which it would be preferable to use the suggested datasets and provide the rationale for each example.

ii) Policy year data instead of accident year data. (2)

iii) Accident quarter data instead of accident year data. (2)

iv) Report year data instead of accident year data. (2)

v) Earned exposures instead of claim counts. (2)

[11]

Q. 7) You are the chief actuary to a general insurance company. The company's main lines of business are employers' liability, marine, aviation and private motor insurance.

i) Describe the features of the business that would influence the choice of investments to be held in respect of these classes of business. (4)

ii) Describe how the investment portfolio will affect the choice of discount rate used in calculating the technical reserves. (2)

You also want to do the Asset Liability Modeling to determine the likely future relationship between its assets and liabilities.

iii) State the particular factors that will need to be incorporated into the model if it is to be used to assess future solvency. (3)

iv) List, with brief reasons for their interest, the parties who may be interested in the level of the solvency of the company. (3)

v) Discuss briefly whether it would be more effective to use a deterministic or a stochastic model. (3)

[15]

Q. 8) i) Explain, very briefly, the following terms:

a) Back Testing (2)

b) Reserving Cycle (2)

c) Reserving Risk (2)

You have been provided with following information collated from filed annual statements of the companies, other sources and some additional analyses:

a) Following information is available at the end of year for the time period from 1995 to 2014
b) Available by insurer and line of business separately; all figures are on a net of reinsurance basis
c) Paid loss triangle (10 Accident Years vs. 10 development years)
d) Booked unpaid liabilities by Accident Year (AY)
e) Distribution of unpaid losses for the most recent AY based on a standard stochastic reserving method applied to the paid loss triangle

ii) Discuss how to investigate whether any reserving cycle existed during this 20 year period of study. (4)

iii) Discuss the steps involved in back testing the reserving risk by AY as estimated by the model (6)

[16]

Q. 9) A newly setup insurer will be writing a certain amount of business in two lines of business, A and B, at the beginning of the coming year. All the losses will be paid at the end of the year. The total available capital with the insurer is 150. Investment return on assets is assumed to be 0%. Assume no further business in the year. Losses from the business written are projected as follows:

Scenario	Probability	Line A	Line B	Total Loss
I	50%	80	20	100
II	49%	120	20	140
III	1%	120	220	340
Expected Value		100	22	122

An exercise is being undertaken to allocate the capital between the two lines so that respective premiums for the two lines could be arrived at. It is decided that capital would be allocated on the basis of the risk measure "Excess Tail Value at Risk" (XTVAR) which is specified as: $E[Y - E(Y) \mid Y > b]$ where 'Y' represents the random variable of all combined losses and 'b' is some chosen cutoff-point.

i) Calculate the required premium for lines A and B combined to achieve an expected return of 10% on the available capital. (2)

ii) Allocate the available capital between lines A and B in proportion to observed values of $E[X_A - E(X_A) \mid X_A + X_B > b]$ and $E[X_B - E(X_B) \mid X_A + X_B > b]$ respectively where X_A and X_B represent respectively the losses for line A and line B. Perform the allocation for two different choices of b: 287 and 137 (6)

iii) What should be the premium for Line A and Line B based on the allocated capital when b is 287 and when b is 137 so that the return on allocated capital is 10%. (2)

iv) Comment on the significance of the selected values of 287 and 137 for 'b'. Also comment on allocated capital and required premiums for the lines A and B, for these two selected values of 'b'. (6)

An insurer utilizes capital modeling to help decide the target combined ratio in the pricing exercise. Someone comments that the target combined ratio could be higher for a longer tailed line even when the target Return on Capital is the same for all lines. The rationale provided is that the investment income could be earned on the technical provisions for a greater time period.

v) What are the other factors that should also be considered for the purpose of setting the target combined ratios? (4)

[20]

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