INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

14th September 2017

Subject ST7 – General Insurance: Reserving and Capital Modeling

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

Total Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. *Please read the instructions inside the cover 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 jurisdiction 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)   XYZ is a medium size insurance company and has been in business for many years. The company has well managed data systems which capture various product and claims details appropriately.

The actuary has been assigned the task to build a stochastic capital model for the company which covers all the major risks faced by the company.

   i)   Discuss the various challenges faced by the actuary with regards to data limitations. For each of these, discuss possible measures that could be taken to improve the correctness of the capital model.   (10)

   ii)   Discuss various checks that can be performed to validate the results of the model.   (7)
[17]

Q. 2)   The actuary of ABC general insurance has two options to estimate company's net reserves:

   a) Estimate gross reserves using gross claims triangles and then net them down using various gross to net ratios.
   b) Estimate net reserves using net claims triangles directly.

   i) Discuss the pros and cons of the two approaches.   (8)

   ii) Discuss another three alternative approaches which could be used to model net claims.   (3)
[11]

Q. 3)   **i)**   The records maintained by various police stations in the country were manual till now. The Government has decided to digitize the records and details of records could be fetched from any police station nationwide. Discuss the impact of digitization of police records on the claim reserves.   (5)

   ii)   Recently 3-year motor third party insurance contracts have been allowed by the regulator. The premium charged under such contract is 3 times the yearly premium prescribed by the tariff. Discuss the impact on:

   a) Calculation of the earning of premium for such contract.   (2)

   b) Investment strategy of the company.   (3)
[10]

Q. 4)   A general insurance company is thinking of launching jewelry insurance cover.

   i)   Discuss possible coverage offered under this product including the list of perils.   (2)

   ii)   List the various rating factors for the product.   (2)

   iii) State various ways to reduce the likelihood of moral hazard under this product.   (3)

   iv)   Suggest suitable reinsurance arrangements for the product   (3)

   v)   How the product is likely to impact the Profit and loss statement of the company in various years.   (2)
[12]

Q. 5)   **i)**   The frequency and severity underlying an insurance product varies by the quarter of the year and is shown in the table below (x and y represent the base frequency and severity

respectively). Assuming no expenses or acquisition costs and that pricing is adequate and reflects quarterly earning pattern, what is the UPR for a

a) 1 year policy written on January 1st at the end of Q2.   (2)

b) 6 month policy written on July 1st at the end of Q3.   (2)

Quarter	Frequency	Severity
1	x	2y
2	0.75x	2y
3	0.5x	y
4	0.25x	y

ii) Provide arguments against closing down an insurance company on the basis of an operating ratio recorded in excess of 100% implying failure to achieve satisfactory levels of profit.   (6)

[10]

Q. 6) As the appointed actuary of an insurance company, you have been requested by the board to evaluate the different reinsurance options available to the company. Provide a report for the board addressing the following three items

i) The factors affecting an insurer's appetite for offsetting its risks through reinsurance   (3)

ii) Fronting and the reasons for choosing it   (3)

iii) Facultative reinsurance and its advantages and disadvantage   (3)

[9]

Q. 7) You are given the following cumulative paid loss triangle.

Cumulative Paid Losses (INR Crores)				
	12	24	36	48	60
2012	2400	7600	10500	13000	14500
2013	2300	7250	9750	12000	
2014	2100	6500	8600		
2015	2000	6000			
2016	1900				

i) Calculate the triangle of link-ratios (and the all-year volume weighted average link ratio) and estimate the unpaid liability.   (3)

Based on your request for further information, you are given the triangle of cumulative closed claims and the estimated ultimate reported claims.

Cumulative Closed Claims	

	12	24	36	48	60	Ult. Reported Claims
2012	4056	6552	7098	7566	7792	7800
2013	4386	7052	7654	8256		8600
2014	4851	7821	8613			9900
2015	4512	7296				9600
2016	4050					9000

ii) Calculate the claim disposal ratios and comment on its pattern   (3)

iii) Restate the cumulative closed claims per the Berquist-Sherman method using the latest diagonal of disposal rates as representative   (2)

iv) Calculate the Berquist-Sherman adjusted paid loss triangle based on the following additional information.   (4)

a) Cumulative Paid Losses = Y
b) Restated Cumulative Closed Claims = X (as per (iii) above)
c) You have fit the exponential curve Y = a*exp(b*X) to each year of the triangle and the coefficients are given below

	a	b
2012	335.97	0.000483
2013	347.24	0.000429
2014	339.12	0.000375
2015	337.1	0.000395

v) Calculate the Berquist-Sherman Reserve for the adjusted paid loss triangle (use all-year volume weighted averages for linked ratios)   (3)

vi) Would you include the claim disposal rate as a source of uncertainty in your actuarial "best estimate" and range communication? Why or why not?   (1)

[16]

Q. 8) **i)** You are given the following –

a) The number of claims for a line in a year follow the following distribution

#	Prob.
0	60%
1	20%
2	20%

b) The amount of each claim for the line in a year follows the following distribution

Amount	Prob.
10,000	80%
100,000	20%

An insurer and a reinsurer have an annual aggregate excess of loss agreement with limit = 50,000 for all claims arising from this line.

What is the copula function for the joint distribution of aggregate annual payout of the insurer and reinsurer?   (5)

ii) The following methods have been suggested for adjusting reserves to allow for reserve risk:

a) Reserves are set equal to the best estimate plus 10%

b) Reserves are set equal to the 75th percentile amount

c) Reserves are set equal to the best estimate plus one standard deviation

Describe the rationale behind each approach and outline briefly the advantages and disadvantages of each method.

(10)

[15]

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