Institute of Actuaries of India

EXAMINATIONS

15th May 2008

Subject ST3 – General Insurance

Time allowed: Three Hours (02.15* - 05.30 pm)

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of the answer sheet/s.*
2. **You have 15 minutes at the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only but notes may be made. You then have three hours to complete the paper.*
3. *You must not start writing your answers until 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. *Mark allocations are shown in brackets.*
6. *Attempt all questions, beginning your answer to each question on a separate sheet.*
7. *Fasten your answer sheets together in numerical order of questions. This, you may complete immediately after expiry of the examination time.*

Professional Conduct:

"It is brought to your notice that in accordance with provisions contained in the Professional Conduct Standards, If any candidate is found copying or involved in any other form of malpractice, during or in connection with the examination, Disciplinary action will be taken against the candidate which may include expulsion or suspension from the membership of IAI."

Candidates are advised that a reasonable standard of handwriting legibility is expected by the examiners and that candidates may be penalized if undue effort is required by the examiners to interpret scripts.

AT THE END OF THE EXAMINATION
Hand in BOTH your answer script and this question paper to the supervisor.

Q. 1)

   (i) Define the terms:
   a. suretyship
   b. moral hazard
   c. subrogation
   d. risk based capital (RBC)   (4)

   (ii) You are a student actuary in a general insurance company that has been writing suretyship
         business for the last five years. Explain how your company could minimize the risk of moral
         hazard in respect of the suretyship cover it provides.   (4)
                                                                                                       [8]

Q. 2)   The government of a small developing nation wants to encourage exports from that country.
             One of the measures that it has taken is to set up an export credit insurer. An exporter can
             buy credit insurance from the insurer for each consignment of goods that it exports. If the
             customer in the foreign country fails to pay for the goods, then the insurer indemnifies the
             exporter.

   (i)   Describe the characteristics of the claims that the export credit insurer is likely
          to receive.   (5)

   (ii)   List the policy data items that the export credit insurer will need to capture when
          setting up a policy on its system.   (3)

   (iii) Suggest appropriate ways to group claim development statistics for this insurer
          when carrying out a reserving exercise to set outstanding claim reserves.   (2)

   (iv)   Describe how the unearned premium reserve would be calculated for this insurer.   (2)

   (v)   Suggest, with reasons, suitable reinsurance structures for the export credit insurer.   (5)
                                                                                                       [17]

Q. 3)   You are an actuarial analyst working in a general insurance company. Your company has
             been writing general insurance business for more than a decade.

             List the items that would be included in a financial model that is to be used in framing
             investment policy for your company.   **[5]**

Q. 4)   Two proprietary general insurance companies, A and B, have been valued as follows, in Rs
             Crore:

	A	B
Value of Assets	600	60
Value of Liabilities	400	50

Each company writes a range of classes of business.

(i)   State the main objective regarding the investment of the free reserves.   (1)

You have been asked to advise on the best investment strategy to use for the assets of each company.

(ii)   Discuss the strategies you would recommend, explaining the rationale behind each.   (7)

(iii)   Describe the extra information you would need to know about the value of assets, liabilities and free reserves of Companies A and B before you could give a more informed level of advice, explaining why this information is important.   (5)
                                                                                       [13]

Q. 5)   A general insurer models claim sizes arising from a section of its liability portfolio using the probability density function:

$$\tfrac{1}{2}\beta^3 x^2 e^{-\beta x} \qquad \text{for } x > 0$$

where x represents the size of an individual claim and β is a positive constant.

The company expects that the total risk premium for business written during the coming year will be Rs.120 million and that the mean claim amount will be Rs. 150,000.

You are given that, for M > 0 and k = 1,2,3,4…

$$\int_M^\infty \frac{\beta^{k+1} x^k}{k!} e^{-\beta x}\, dx = e^{-\beta M}\left(1 + \beta M + \frac{\beta^2 M^2}{2!} + \dots + \frac{\beta^k M^k}{k!}\right)$$

(i)   Calculate the theoretical risk premium for unlimited individual excess of loss reinsurance to cover business written during the coming year, based on retention of Rs. 400,000, stating any assumptions you make.   (9)

The actual premium quoted by the reinsurer for this cover is Rs 1.5 million.

(ii)   Give reasons why you would expect the actual premium to differ from that calculated in part (i).   (7)
                                                                                       [16]

Q. 6)   In a certain country all general insurers are required to maintain a minimum solvency margin (MSM) of not less than 50% of the earned premiums, net of reinsurance, during the previous twelve months. Assets are valued on a market value basis and investments abroad are not permissible in the calculation of MSM. Liabilities are valued on generally accepted principles.

Discuss the various steps that might be available to an insurer to improve its MSM requirements, commenting on the suitability of each option.   **[15]**

Q. 7) Insurance company A started business on 1 April 2005 with free reserves of Rs 100 Crore. The Revenue accounts for 2005-06 and 2006-07 are as shown below, covering periods from 1 April to 31 March. (Amount in Rs. Crores)

	2005-06	2006-07
Written premium	450	600
UPR b/fwd	0	225
UPR c/fwd	225	300
Earned premium	225	525
claims paid	120	300
Outstanding Claims b/fwd (including IBNR)	0	62
Outstanding Claims c/fwd (including IBNR)	62	140
Incurred Claims	182	378
Expenses and Commission	120	160
Increase in DAC	35	10
Underwriting profit/(loss)	-42	-3
Investment Income(allocated to technical reserves)	33	40
Insurance profit/(loss)	-9	37

There were no realised capital gains or losses in either year. However total unrealised capital losses were 15 and 25 respectively as at 31 March 2006 and 31 March 2007.

(i) Define claims and expense ratios. (1)

(ii) Calculate the claims and expense ratios for company A for 2005-06 and 2006-07. (2)

(iii) Define free reserves. (1)

(iv) Calculate the free reserves for company A as at 31 March 2006 and 31 March 2007, stating any assumptions made.

(3)

The CEO of company A has suggested that the outstanding claims may be discounted because the mean term of the outstanding claims is about two years.

(v) Recalculate the underwriting profit and the insurance profits on a discounted basis using a rate of 10% per annum, assuming that the investment income allocated to technical reserves is unchanged. (4)

(vi) Comment on the effects of discounting on profitability. (4)

[15]

Q. 8)   The following are the paid claim figures for a certain class of business.

Paid claims (Rs Lakhs)

Accident Year	Development year				
	0	1	2	3	4
2002-03	500	260	73	15	5
2003-04	525	252	81	16	
2004-05	521	246	72		
2005-06	560	300			
2006-07	600				

Accident years are from 1 April to 31 March.

(i)   Calculate the outstanding claim reserve as at 31 March 2007 using the basic chain ladder method.

An actuarial assistant prepared the following table to estimate the outstanding claims for this class of business.

Accident Year	Development year					Outstanding claims end 2006-7
	0	1	2	3	4	
2002-03						0
2003-04					5	5
2004-05				14	5	19
2005-06			90	18	6	114
2006-07		300	90	18	6	414
Dev ratios	0.5	0.3	0.2	0.33		

Total outstanding claims as at 31 March 2007 is Rs. 552 Lakhs   (4)

(ii)   Compare this result with that produced using the chain ladder method and comment thereon.

Another assistant has suggested the use of statistical methods to estimate outstanding claim reserves for all classes of business.   (2)

(iii)   List the possible sources of error when using statistical methods.   (5)

[11]

****