Actuarial Society of India
EXAMINATIONS

17th November 2005

Subject ST3 – General Insurance

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

INSTRUCTIONS TO THE CANDIDATE

1. *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.*
2. *You must not start writing your answers until instructed to do so by the supervisor.*
3. *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.*
4. *Mark allocations are shown in brackets.*
5. *Attempt all questions, beginning your answer to each question on a separate sheet.*
6. *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 ASI."

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)

(a)

  i) What is meant by memory less property of the exponential distribution. **(1)**

  ii) Assume that the aggregate claims is a Compound Poisson process. Define the adjustment coefficient. **(1)**

  iii) Define probability of ruin [both in continuous and discreet time]. **(3)**

  [5]

(b) Past experience indicates that the number of claims received per month ~ Poisson (l) and that the claim amounts ~ Exp (α). The insurer's security loading is set at q %. An initial surplus of U has been set aside It is given that $l = 50$, $q = 25\%$, $\alpha = 20000$ and U = INR 100000

  i) Express the formula for the adjustment coefficient in the form $R = \dfrac{q}{(1+q)a}$ **(3)**

  ii) Calculate the adjustment coefficient. **(1)**

  iii) Give an upper bound for the insurer's probability of ruin. **(1)**

  iv) How will your answer to (i) above be affected if it is noticed that the claim numbers ~ Poi(70) instead of Poi(50). **(1)**

  v) Justify your result in (iv). **(2)**

  vi) What level of initial surplus will be required if the insurer desires to reduce the security loading to 20%, but would have the same upper bound for ruin probability as in (iii). **(2)**

  [10]

  Total [15]

Q.2) The following information about the amounts of claims paid and the number of policies sold for a certain class of insurance for each of the last four years for three different insurers A, B, C is available.

		Year 1	Year 2	Year 3	Year 4	Expected in year 5
A	Claims paid	INR 11.00M	INR 11.81M	INR 9.68M	INR 22M	
	No of Policies	2000	2250	1800	4000	4000
B	Claims paid	INR 250.00M	INR 373.13M	INR 262.5M	INR 250M	
	No of Policies	50000	75000	52500	50000	50000
C	Claims paid	INR 500.00M	INR 550.00M	INR 515M	INR 545M	
	No of Policies	100000	110000	103000	109000	109000

Insurer A has estimated the number of policies to be sold as 4000 and by multiplying this by the average claim cost per policy over the last four years to arrive at a figure of INR 260 M However the volume being relatively small has asked you to examine the credibility of this estimate.

(i) Analyse the data using EBCT Model 1, and calculate the expected total claim payment to be made by the company in the following year. **(6)**

(ii) Analyse the data using EBCT Model 2, and again calculate the expected payout amount in the following year, **(8)**

(iii) Calculate the credibility factors for B and C under EBCT Model 2 **(2)**

(iv) Comment on the results **(3)**

Total [19]

You may use the summary statistics given below, which have been calculated using the formulae and notation given in the Tables, again working in millions of Rupees.
Subscripts 1, 2 and 3 refer to Insurers A, B and C respectively.

$$\sum_j P_{1\,j}(X_{1,j}-\overline{X}_1)^2 = 0.0001070 \qquad \sum_j P_{1\,j}(X_{1,j}-\overline{X})^2 = 0.001866$$

$$\sum_j P_{2\,j}(X_{2,j}-\overline{X}_2)^2 = 0.0000310 \qquad \sum_j P_{2\,j}(X_{2,j}-\overline{X})^2 = 0.000063$$

$$\sum_j P_{3\,j}(X_{3,j}-\overline{X}_3)^2 = 0.0000000 \qquad \sum_j P_{3\,j}(X_{3,j}-\overline{X})^2 = 0.000005$$

Q.3)

(a)

(i) Two companies A and B have same level of premium income and same classes of business. Nevertheless Company A holds much larger claims reserves than company B. List the possible reasons for this.

(3)

(ii) List the circumstances under which Case estimation may be preferred to statistical methods for determination of claim reserves.

(3)

(iii) List the four main classes into which statistical methods for reserving may be classified

(2)

(iv) You have a run-off triangle of paid claims split by accident year. Suggest possible reasons for:
    (a) A row of figures that is unusually high
    (b) A column of figures that is unusually high
    (c) A diagonal of figures that is unusually low.

(3)

(b) There are two different ways of classifying the experience rating systems into two types. List all the four types. **(2)**

(c) What is the UPR as on 31st March in respect of a risk which commenced on 4th November if the insurer uses the 24 ths method ? **(1)**

Total [14]

Q.4)

(i)   Explain the use of the following key indicators in interpreting accounts of a general insurance company:

- Claim ratio (or loss ratio)
- Solvency ratio
- Length of tail

(5)

(ii)   An actuarial student has made out the following extract from the accounts of a general insurance company for four years:

Rupees million

Description of item	Year 2001	Year 2002	Year 2003	Year 2004
Written premiums	NA	37.5	40	60
Claims paid	NA	32	30	30.5
Expenses paid	NA	36.2	38.8	42.5
Increase in DAC		0.3	0.3	1.0
Increase in outstanding				
Claims reserves	NA	13.8	3.8	11.2
UPR	17.5	18.8	20	37.5
Outstanding claim				
Reserves	125	111.2	115	126.3
Adjustment for DAC	(1.25)	(1.5)	(1.8)	(2.8)
Investment income	NA	22.5	10	25
Tax	NA	7.3	2.8	5.5
Dividends	NA	17.5	18.8	20
Retained profits		4.2	10.2.	3.8
Shareholders' funds	20	28.8	19	15.3
Total assets	166.2	157.7	152.3	176.2

Calculate the ratios stated in (i) above and comment in detail on any trends brought out by them.

(10)
Total [15]

Q.5)

    (i) Describe the business risks that affect all general insurance companies. **(8)**

    (ii) Discuss how any of these, in particular, affect a small company established three years ago operating with a high proportion of reinsurance and is now desirous of expanding faster primarily by introduction of new classes of business in to its portfolio. **(7)**

                                                Total [15]

Q.6) An actuarial student has extracted the following information from the business plans of two companies:

Figures in Rupees million

Description of item	Company A		Company B	
	Year 2005	**Year 2008**	**Year 2005**	**Year 2008**
Gross written premiums	25	40	240	300
Net written premiums	18	25	216	270
Commission & brokerage	2.5	4.5	12	15
Expense ratio	18%	20%	14%	15%
Solvency margin	50%	35%	75%	75%
Business Mix:				
Motor	25%	25%	20%	22%
Engineering	10%	5%	15%	17%
Product liability	7%	10%	10%	10%
Other liability	5%	10%	15%	15%
Health & PA	23%	25%	20%	17%
Fire	30%	25%	20%	19%

    (i) State differences, if any, you would expect to find in the investment policies of the two companies. **(5)**

    (ii) Suggest possible investment portfolios for the two companies as at the end of the years 2005 and 2008. Give reasons for the portfolios. **(5)**

                                                Total [10]

Q.7) A general insurance company is considering entering in to professional indemnity insurance to be granted to firms advising on design and construction of commercial and office complexes in major cities of the country. The company has approached you for advice on pricing.

    (i) List possible measures of exposure you would consider. **(2)**

    (ii) Discuss the main difficulties relating to pricing. **(10)**

                                                Total [12]

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