

INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

November 2025

**SP7 – General Insurance Reserving and Capital
Modelling**

Time allowed: 3 Hours 15 Minutes

Total Marks: 100

- Q. 1)** A mid-sized insurer writing motor business insurance is concerned about climate change risks.
- i) Explain *two* ways in which climate change could impact the insurer's reserving and pricing assumptions. (2)
 - ii) Discuss how the regulator might respond if the insurer fails to consider climate change adequately in its risk management framework. (3)
- [5]**
- Q. 2)** ABC Insurance Company has recently launched a cyber insurance product for small and medium enterprises (SMEs). The company is experiencing rapid growth in this line but is concerned about reserving challenges due to limited historical data.
- i) List the covers that an SME Cyber insurance maybe expected to cover. (2)
 - ii) Outline the unique characteristics of cyber insurance claims that make reserving challenging compared to traditional property lines. (3)
- The company wants to use industry benchmarking to supplement its limited data.
- iii) Outline the key considerations and challenges when using external data for cyber insurance reserving. (3)
 - iv) Suggest *two* appropriate reserving methods for this emerging line of business in the absence of credible internal data, stating the advantages and limitations of each method. (4)
- [12]**

- Q. 3)** Following is the financial information of ABC General Insurance Company in its first year of writing business as at 31st March 2025 (INR Crores):

Profit & Loss Account for the year ended 31st March 2025:

Gross Written Premium	3,000
Net Written Premium	1,800
Gross Earned Premium	2,000
<i>Less: Reinsurance Premium Ceded</i>	800
Net Earned Premium	1,200
Net Claims Paid	450
Change in Outstanding Reserves (net)	900
Commission (net)	180
Operating Expenses	270
Investment Income	360

Balance Sheet as at 31st March 2025:

Assets	
Current Investments	3,000
Cash and Bank	400
Other Assets	600
Liabilities	
Technical Reserves (net)	1,500
Shareholders' Fund (paid up)	1,800
Other Liabilities	700

The Closing Outstanding Case Reserves (part of net Technical Reserves) at the end of the year is 750cr.

The required solvency margin mandated by the regulator of the country is to be calculated as the maximum of the following:

- 50% of the Net Written Premium
- 50% of the Outstanding Case Reserves at the end of the year

The risk-free rate of interest in the country is at 5% currently.

i) **Calculate** key financial ratios based on the above information on the company's

- a. Underwriting performance and
- b. Financial health

(7)

ii) Comment on the above calculated ratios.

(5)

[12]

Q. 4) You are the actuarial manager for a medium sized general insurance company, which writes liability products for consultants, law firms, and small corporations.

The company currently writes its Professional Indemnity (PI) policy on a claims-made basis but is considering switching to a losses-occurring basis.

i) Explain the key differences between losses-occurring and claims-made basis of cover in general insurance.

(5)

ii) Discuss the advantages and disadvantages for the insurer of writing PI business on a claims-made basis rather than a losses-occurring basis.

(5)

iii) Outline the implications for reserving, reinsurance, and capital modelling if the company changes its PI product from a claims-made basis to a losses-occurring basis.

(5)

[15]

Q. 5) The regulator of a small country has announced a transition from deterministic to risk-based capital framework with stochastic modeling requirements.

- i) Compare deterministic and stochastic methods of capital modelling. (4)
- ii) Outline the modelling considerations with respect to stochastic capital models for a multi-line general insurer:
 - a) Correlation structures (2)
 - b) Model validation requirements (2)

Company Z in this country writes property and liability business. Its internal model produces the following one-year VaR capital requirements (at 99.5%ile):

- Property risk: 120 Cr
- Liability risk: 100 Cr

The company believes correlation between the two risks is 0.25.

- iii) Stating any assumptions, calculate the total capital required for Company Z at the 99.5%ile. (3)
 - iv) Calculate the diversification benefit. (1)
 - v) Discuss two alternative methods for modelling dependency between risks in capital models. (5)
- [17]

Q. 6) You are an actuary leading the reserving team at a general insurance company that specializes in liability insurance. The company has been experiencing volatility in its reserves due to change in claims handling staff. The actuarial team needs to estimate reserves for professional indemnity claims using multiple methods to cross-validate their estimates.

You observe the following:

- Paid-to-incurred ratios have been increasing steadily in the last three years.
- Case estimates are being set by newly trained claims handlers.
- i) Discuss the possible reasons for these observations and implications of these observations. (7)

You arrive at the following results using chain ladder method on paid and incurred claims triangle. Assume that both paid and incurred developments are fully run off at the 6th development year.

AY	Earned Premium	Paid			Incurred		
		Latest Diagonal	Reserve	Ultimate	Latest Diagonal	Reserve	Ultimate
2020	180	92	0	92	94	0	94
2021	195	95	3	98	99	1	100
2022	210	92	17	109	100	8	108
2023	225	78	106	184	102	25	127
2024	240	52	408	460	95	90	185
2025	255	30	236	266	75	74	149
Total		439	770	1209	565	198	763

- ii) Comment on the differences in the above results between the paid and incurred methods and which method you would prefer for this line of business. (3)

The underwriter at the company has given you an Initial Expected Loss Ratio of 45% for all the accident years.

- iii) Apply the Bornhuetter-Ferguson(BF) method to the incurred results above using an Initial Expected loss ratio of 45%. (4)
- iv) Comment on the appropriateness of using an Initial Expected loss ratio of 45%. (2)
- v) Comment on the difference between your BF results with the Chain Ladder estimates. (2)
- [18]

Q. 7) An insurer writes a single portfolio for the year with gross earned premium of 120 Cr. The insurer purchases the following reinsurance for the same year:

- Reinsurer A: Quota Share (QS): 40% proportional cession with a 20% fixed commission
- Reinsurer B: Per-Risk XoL: 5 Cr xs 1 Cr, annual premium at 10% ROL, written net of QS. No reinstatements.
- Reinsurer C: Catastrophe XoL (Cat XoL): 40 Cr xs 5 Cr, annual premium at 6% ROL, written net of QS and after Per-Risk XoL (i.e., CAT applies to per-event losses after QS and after Per-Risk XoL).

The portfolio experiences the following ground-up (gross) losses during the year:

- Attritional losses (excluding event X): 45 Cr, comprised of many small claims each below 1 Cr.
- Event X (catastrophe): Four claims of 3 Cr, 4 Cr, 6 Cr, 8 Cr.
- Isolated large losses after Event X (non-cat): 8 Cr and 1.5 Cr.

Risk XoL responds per claim (net of QS). Cat XoL responds per event to the residual per-event loss after QS and after Risk XoL.

- i) Calculate the insurer's net underwriting result for the year after all reinsurance cashflows and state any assumptions you make. (10)
 - ii) Explain the key differences between proportional and non-proportional reinsurance. (5)
 - iii) Discuss how heavy reliance on reinsurance could impact the insurer's investment strategy. (6)
- [21]**
