INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

November 2026

SP9 - Enterprise Risk Management

Time allowed: 3 Hours 15 Minutes

Total Marks: 100

Q.1) You are a consulting actuary specializing in ERM, invited by the Board of a BFSI (banking, financial services and insurance) conglomerate to advise them and help them set up the ERM function. The Board is contemplating setting up an enterprise risk management (ERM) function.

i) Explain to the Board how an effective ERM setup might contribute to the improved business performance of the conglomerate. **[7]**

ii) Also explain to the Board what their governance and oversight responsibilities might be in respect of ERM. **[5]**

iii) Your advice has also been sought regarding the hiring of a CRO to lead the new ERM strategy and defining their roles and responsibilities. Outline the key responsibilities that you would suggest being listed as part of the job description. **[6]**

iv) Also outline the key desired skills, capabilities and traits that you would suggest being listed as part of the job description. **[4]**

[22 Marks]

Q.2) You are an actuary specializing in risk measurement, modelling and management. You have been contracted by a life insurance company having business in multiple countries and exposure to multiple currencies to advise their employers on a retainership basis. The following are the questions posed to you during the course of this engagement. Provide a suitable response to each of them.

i) Describe some of the ways and considerations of managing foreign exchange (FX) risk and liquidity risk in the context of a multi-national life insurance company. **[8]**

ii) For each of the below-mentioned risks, assess the extent to which they can be effectively modelled quantitatively:

- Agency risk
- Basis risk
- Credit risk
- Demographic risk
- Environmental risk
- Liquidity risk
- Operational risk
- Reputational risk

[8]

iii) In the context of modelling risks, critically compare the advantages and limitations of use of simple models versus complex models, and the associated trade-offs. **[7]**

iv) Explain credit default swaps (CDS) as a tool to manage credit risk. Also illustrate how costs and usefulness of the various CDSs might compare using the following examples:

- A CDS with a single reference bond
- A first-to-default CDS with a portfolio of 25 reference bonds
- A fourth-to-default CDS with the same portfolio of 25 reference bonds

[6]

[29 Marks]

Q.3) You are a visiting professor at an actuarial science programme. After your last scheduled lecture, you are staying back to answer questions from a few curious and enthusiastic students. Respond to their questions with suitable examples / numerical computations as appropriate.

i) "I keep getting confused between credit risk, counterparty risk and credit spread." Explain the three concepts with suitable examples, including how they relate to each other. **[8]**

ii) "Systematic risk is the risk faced by the entire system, while specific risk is the risk specific to an organisation. Isn't it?" Respond to this statement, distinguishing systematic, systemic and specific risk and using appropriate examples for explanation. **[5]**

iii) "I simply cannot imagine how operational risk losses can be subjected to a Monte Carlo simulation." Demonstrate a manual Monte Carlo simulation of five scenarios (using hand computations, aided by a calculator, rather than advanced computing capability), for each of the following three operational risks:
Risk X: Employee/policyholder fraud – certain to occur, the associated aggregated loss might follow a triangular distribution with a minimum, maximum and modal value of Rs. 0, Rs. 1 crore and Rs. 10 lakh respectively.

Risk Y: System downtime – expected to occur with a 25% probability, with the associated monetary loss following an exponential distribution with a mean of Rs. 25 lakh.

Risk Z: Workplace accidental death – the number of such deaths follows a Poisson distribution with mean 2, while the payout for each death is fixed at Rs. 50 lakhs.

Use the following table of pseudorandom values generated independently from the uniform distribution on [0,1]:

To be used for		Simulation scenarios				
		1	2	3	4	5
Risk X	Occurrence	0.891	0.078	0.612	0.247	0.373
	Loss value	0.632	0.050	0.026	0.796	0.550
Risk Y	Occurrence	0.638	0.102	0.082	0.874	0.361
	Loss value	0.122	0.978	0.433	0.956	0.810
Risk Z	Occurrence	0.632	0.837	0.100	0.208	0.618
	Loss value	0.797	0.974	0.059	0.743	0.720

Simulate loss amounts for each of the risks for each scenario. **[12]**

iv) "I don't really see how copulas can be used to combine losses… and do they even matter?" Using the above simulated losses, compare the mean (which is a measure of central tendency) and the range (measure of spread/dispersion) of losses across the scenarios and explain the impact of the dependency structure (comonotonicity copula instead of independence copula). **[3]**

[28 Marks]

Q.4) You are an actuary specializing in investments and capital modelling, sent on secondment to a general insurance company to set up and implement their internal capital model for the first time. Later, you will move back to the group investments team.

i) You are first asked to create a plan for the implementation of the internal capital model. Describe the key stages that you will cover as part of the plan. **[10]**

ii) In the context of calculation of capital at business unit level (or allocation of capital at that level), there are differing priorities regarding the choice of risk measure – some suggest using VaR while some want it to be

coherent. Examine the relevance of the selected risk measure being coherent for capital calculation / allocation, including a specific discussion pertaining to VaR. **[5]**

iii) Now you are back to the investments team, where you have to invest a total sum of Rs. 100 crore, split between the following two options:

Option	P	S
Expected return (per annum)	8%	14%
Standard deviation	2%	3%

Determine the amount that you must invest in each of the options to get a portfolio which has the least variance. You may assume correlation of 25% between the options. How does this Sharpe ratio compare with the Sharpe ratio for the case where money is equally split between the two options? **[6]**

[21 Marks]

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