

Institute of Actuaries of India

Subject SA3 – General Insurance

June 2019 Examination

INDICATIVE SOLUTION

Introduction

The indicative solution has been written by the Examiners with the aim of helping candidates. The solutions given are only indicative. It is realized that there could be other points as valid answers and examiner have given credit for any alternative approach or interpretation which they consider to be reasonable.

Solution 1:

- i) Unallocated loss adjustment expenses (ULAE) are expenses that are not attributed to the processing of a specific insurance claim. ULAE, along with allocated loss adjustment expenses (ALAE), represent an insurer's estimate of the money it will pay out in claims, as well as expenses associated with processing those claims. [1]
 ULAE are usually company's internal costs, including salaries for claim staffs, overhead costs of rent and utilities pertaining to claims handling function etc. [1]
 [2]
- ii) The value placed on the liabilities must make appropriate provision for future expenses and this provision must at least equal that required if the company were to close new business one year after the valuation date. The possibility that preferential service agreements, if any, might be altered or terminated also needs to be taken into account. [2]
- iii) Paid to paid method - using the Ratio of total paid unallocated expenses to the total Paid Losses during the financial year

An average **Paid Expense to Paid Loss Ratio (PPR)** for several years are considered. In case the trend is stable, the ratio of the recent year can be used.

Then an estimate is made to determine the percentage of unallocated expense remaining unpaid on open claims which are recorded on the company's books. Generally, the following key assumption is made:

- Fifty percent of this ratio is applied to the reserve for known outstanding claims, since roughly half the unallocated work is already completed on known claims
- One hundred percent of the ratio is applied to the IBNR reserve

Other assumptions are:

- ULAE outstanding is proportionate to outstanding losses
- ULAE and losses are paid at the same time and rate
- ULAE is independent of age of the claim
- Inflation impacting losses is the same as inflation impacting ULAE

$ULAE\ reserve = PPR * [50\% * Outstanding\ Claims\ Reserve + IBNR\ reserve]$

- The reserve is distributed to accident year in proportion to the loss reserve, hence, it is assumed that the age of the claim does not effect the ratio of paid unallocated loss adjustment expenses to losses. [4]

Limitations:

[1 mark each for valid points]

- Paid losses do not accurately represent work done by claims department
- Unallocated Loss Adjustment Expenses are independent of age of claim and ULAE are paid at the same time as losses – both are not always true

- This method is appropriate in case of short tail business with stable and consistent claims reporting and settlement pattern
- In high inflation scenario, % of ULAE paid at claims closure is usually significantly greater than % of ULAE paid at the claim opening stage – tend to understate the ULAE reserve
- If a company is growing rapidly in a low inflation environment, this method will overstate the ULAE reserve

[3]

[7]

iv) Possible next course of actions can be – [1 mark each for valid points]

- As this is the first role as Appointed Actuary, I will possibly have recourse to another Senior Actuary as Mentor – need to discuss with him and understand the regulatory implications
- As per the Actuarial Practice Standard (APS 33), all relevant and significant aspects of the actuarial work relating to the annual statutory actuarial valuation needs to be peer reviewed by an external Actuary. I can seek his/her comments in this regard
- As far as the regulation is concerned, there is no specific requirement of explicit ULAE reserve. But this has been mentioned in the Actuarial Practice Standard and the Appointed Actuary has to comply with that while carrying out the annual statutory valuation. Hence it would be useful to discuss this matter with the Professional Body and get its views
- In line with the methodology adopted above, I would like to carry out detailed expense analysis for current financial year and estimate the ULAE provision. The same can be done for last three years to understand the movements. This can then be presented to the Board in due course of time for decision making.
- Communicate to Board (explaining the challenges)

[3]

v) The potential implications of such analysis to the Company need to be assessed in view of the way such analyses and results will be interpreted by the reader. The following are some of the key implications: [0.5 mark each for valid points]

- The analysis and the apparent shortfall can be published in a report which would generate concerns about the true financial health of the Company
- Possibility of reserve strengthening will come into picture for coming years which may impact the profit projection
- Negative market comment and concerns could result in a negative outlook towards the parent Company too and it may adversely impact the share price
- Possibility of downgrading in the Parent Company's credit rating
- It could also materially impact the Company's ability to raise debt which may in turn impact any capital infusion plan by the Parent Company to the Insurer in support of business growth – this will adversely impact any future strategic growth plan the Insurer has made
- Regulator may probe this further and it may lead to a more detailed scrutiny of the Insurer's book
- Any negative comment in the market would eventually lead to a reputational damage which may result in losing market share

- This may also trigger concerns and re-assessments of other insurance companies and hence have a negative impact on the whole of the insurance sector. The shortfall is unlikely in isolation to have a material impact on the Company's solvency position, however, if this is combined with market weakness and forced management actions this could have detrimental capital implications [4]

- vi) As the Appointed Actuary of the Company I have access to more in-depth information like – Quarterly loss development triangles – both paid and incurred
- Claims data pertaining to attritional, large and catastrophe losses
 - Reinsurance recoveries
 - Split between pure claims cost (including accrued interest) and the allocated loss adjustment expenses
 - Split between death, bodily injury
 - Nil settlement cases
 - Exposure data by number of policies or premium volume
 - Access to the claims department who maintains transactional level claims data [2]

On top of the above data items, as an Appoint Actuary I would have more information around the Company's strategic plans, claims management philosophy, results of any claims initiatives taken up by the Company in past, changing mix of business etc. [1]

All these would impact the projection and the resultant provision figure is reflective of the same. This would not be possible to apprehend easily by external Analyst and factor such qualitative and granular information in the analysis.

Impact of such in-depth information in reserve projection: [0.5 mark each for valid point]

- Quarterly claims development data would help in allowing for seasonal variations – annual loss development factors may not reflect this completely.
- If the paid triangles are published, that won't contain sufficient information as would have captured by the Incurred claims data available internally.
- Incurred claims data is more useful in case of long tailed lines like Motor Third Party liability – it allows to account for any change in settlement rates and the claims handling process.
- Large claims, if not segregated from the attritional claims will over inflate the ultimate claims from the aggregated data. By removing them and the Cat claims, the attritional claims can be modelled better and separate loading can be made on account of large / cat calims.
- Any changes in reinsurance need to be assessed appropriately before making any comment about shortfall or excess provision. Impact of a reduction in retention level may not be seen clearly from the aggregated data and may result in overestimation of liabilities.
- Motor third party liability claims are usually prone to lengthier litigation process, whereby the tendency of the Court is to award interest component in addition to the pure claims

amount. If the Company has set up a practice by providing for interest component in Its outstanding claims, this needs to be factored while estimating IBNR.

- Chain ladder may not be the most appropriate method in case of Motor Third Party liability. It assumes the past will be a fair reflection of future which is usually not the case in this line of business which is heavily influenced (positively/negatively) by the external factors like Court awards.
- Due to the availability of more granular data, I would have tried out multiple methods and estimate the IBNR reserve accordingly.
- Splitting the claims data by death and bodily injury cases would have revealed better picture as the pattern of claims development (historical inflation) are usually different.
- Any changes related to nil settlements can have a material impact on the claim provision. This can be a scenario where the claims handling practices have changed to take care of the fraudulent claims.
- Exposure data is very important in this context as it will reveal changing exposure in different risks.
- Individual claims level data would be very useful to allow for any specificity of an unusual claim.
- The Company may have, in past, initiated practice of out of court settlements which would eventually reduce the claims outgo as compared to the Court awards. I will have details pertaining to such initiatives and can factor them appropriately in my reserve estimation. On the other hand, the Analyst may not be able to decipher it from the published information and overestimate the reserve requirement.
- Changing risk mix in different geographies would have a huge role to play, especially in case of Motor Third Party liability book. Such changes may not be easily reflected from the aggregate level data. [4]

[7]

[25 Marks]**Solution 2:****i) Merits:**

- **Persistency:** The innovative product structure would help increase persistency as the policyholders will try to avail benefit at the end of year 5. [0.5]
- **Marketability:** The proposed product structure is different from what has been offered in the industry. This will ensure better marketability for the product from the point of view of sales. [0.5]
 - **Better risk selection:** The inherent assumption would be that policyholders who feel they are less likely to make a claim will enroll in this feature. This is likely to lead to better risk selection. [1]
 - **Less claim handling expenses :** A bare minimum claim expenses are incurred at the time of handling of claims irrespective of the size of the claim. Since the policyholder is incentivized not to claim in cases where the perceived benefit of premium refund is greater than the amount of claim there would be a significant reduction in the claim related expenses [1]

- Reduced frequency of claims: As better risks are expected to take on this feature the frequency of claims is likely to decrease. Additionally, since the smaller claims would not be made to avail the benefit of premium refund the frequency of claims is expected to fall further. [1]

[3.5 Marks Max]

Demerits:

- Refund percentage: 80% is significant premium refund. Insurance works on the concept of pooling of risks. In spite of the incentive provided to the policyholder so as not to claim there would still be claims made on the portfolio. The premium post allowance made for the refund should be able to fund the claims made on the portfolio. This can severely dent the profitability to the portfolio as well. [1.5]
- Severity: Claims severity will go up. This is because policyholder would claim for larger amounts where the benefit of premium refund is lower than the amount of the claims. [1]
- Period: 5 years may be considered too long a period. This will not be attractive to customers who use the cars for less than 5 years [0.5]
- The regulator might look at this product as an investment guarantee type product. Might not allow such a structure within the general insurance space where there is an explicit investment guarantee [0.5]
- Difficult to price such a product. It is a complex product structure and assumptions would have to be made about the future customer behavior [0.5]
- IT system set up difficultly. 5 year track history and above needs to be maintained [0.5]
- May lead to delay in reporting claims and significant build up of claims after the 5th year. [0.5]

[3.5 Marks Max]

[7]

ii) The 3 key assumptions at the time of pricing are:

- Frequency improvements: Since the policyholder will benefit from not claiming the overall behavior can change. [1]
- Severity deterioration: Policyholders will claim only if the severity of the claims is significantly higher than the perceived benefit of premium refund. This will increase the overall severity. [1]
- Persistency: Persistency will be a key consideration for pricing such a product since only the persistent policies will be eligible for a premium refund. [1]

[3]

iii) Reserves:

Current Regulations:

- The current regulations in India allow for IBNR reserves. Considering that the company has adequate experience the IBNR reserves would be calculated basis triangulation approaches or ULR method
- Additionally, presently the discounting of reserves is not allowed as per the regulation.

- However, the proposed product structure would not fit in the overall triangulation approach and hence a different approach basis the cashflow method would need to be adopted for the calculation of reserves. [1.5]
 - Considering that the product feature will not fit in the current reserving approach framework the following method needs to be used:
 - Present value of future claims = Present value of premium payouts:
 - Reserves need to held on a per policy basis ideally or at a cohort level by grouping policies with due allowance for discounting if allowed for by the regulation
 - Allowance should be made for all the cashflows including expenses and commissions.
 - Allowance should be made for attrition claims by the traditional triangulation approach. [0.5 marks for each point]
- [2 Marks Max]

Assumptions need to be made for:

- Renewal rate- High renewal rate in the 4th and 5th year as the policyholder will try to avail the benefit [0.5]
- Improvements in frequency- High frequency improvements as we come closer to the 5th year [0.5]
- Whether discounting allowed or not? The current regulation does not allow for discounting of reserves. How will the same be incorporated [0.5]

Problems in setting reserves:

Lack of data available regarding renewal experience and future policyholder behavior. [0.5]

Non traditional approaches need to be used for reserving which will be in divergence from the current IBNR reserving approach [0.5]

Comparison needs to be made with the pricing assumptions on a frequent basis to restate any assumptions if required. [0.5]

Expenses: Per policy expenses might come down as the exposure might increase. [0.5]

Call needs to be taken to see if the reserves will be calculated at a grouped cohort level or at a per policy level. Per policy reserves will be accurate. [0.5]

APS 21 needs to be complied with to ensure that there is sufficient margin in the reserves for adverse experience. [1]

Considering that the product is a motor policy assumptions need to be made with respect to future premiums in the calculations. For this assumptions would need to be made with respect to the insurance environment and the prices competition is charging. An increase in premium will lead to increase in reserves in the future years and reduction in premium will lead to a reserve release. [1]

Reserves need to be released when there is a claim made. The frequency of calculation of these reserves need to be specified. [0.5]

[8]

- iv)
- Provides a regular stream of income to claimants [1]
 - Lump sum payments may fall insufficient in the longer run [1]
- [2]**
- v) Offering claim payments as periodic payouts instead of a lump sum payment will lead to complexities in the following major areas:
- Pricing complexities: The pricing of such structures would need to be revisited and due allowance would need to be made size and term of the payments. Additionally, these revised structures would additionally have to be filed and approved by the regulator. Additionally, if allowed for the installments should move in line with interest rates and inflation. If that is a case interest rate linkages should be considered at the time of pricing [2]
 - Investment considerations: The assets and liabilities would have to be closely matched since the liabilities would have a long term tenure which may or may not be matched by the available assets [1]
 - Reinsurance recoveries: The reinsurance recoveries would happen over the period of claim payments and not at a single time point. Treaties may have to be redrawn to allow for this change. Additionally, there is a higher risk of reinsurance failure due to increased credit risk since the payments are for longer durations. [2]
 - Reserving implications: Whether discounting allowed or not? If discounting is not allowed it might lead to significant capital requirements. The methodology might have to change from a triangulation approach to a more cashflow approach [1.5]
 - IT set-ups: The systems need to undergo a major overhaul to manage these periodic payments. [0.5]
 - Increased Expenses: The insurance company would entail significantly higher expenses to provide periodic payments to the claimant as opposed to a single lump sum payment [1]
 - Reporting requirements: There might be additional reporting requirements for claims that need to be paid over a longer term. [1]
- [8]**
- vi) The regulator may specify or impose the following:
- The total payment through installments should be greater than lump sum payment. This would ensure that the policyholder does not lose out by not undertaking the lump sum option [1]
 - Maximum and Minimum Period for which the lump sum payment is made. The regulator can specify the minimum and maximum periods to ensure that the payments are made for a specific time period and overall longevity risk is also managed [0.5]
 - Periodicity of the claim payments: monthly, quarterly etc. including the option to alter the same. This allows the policyholder to avail payments as per his liabilities. [1]
 - Mode of payment [0.5]
 - Minimum sum insured threshold. This would ensure that the cost of making such payments do not outweigh the quantum of payments made. [0.5]

- The option to choose either of the two options : lump sum or installments including the option to avail certain percentage of sum insured as lump sum and rest as installment This allows the policyholder to match his liability profile. [1]
 - The regulator might specify the disclosures in terms of policy wordings, sales literature to specify the benefits clearly. This ensures that there is adequate knowledge while accepting such an option [1]
 - The regulator may ask to keep the premium rates constant for both the options. This would ensure that the policyholder is not treated unfairly basis the option chosen [1]
 - The regulator may specify whether a linkage to the interest rate is allowed or not while arriving at the installment value [1]
 - Considering that such features are offered for the first time the regulator may specify the period of reviews to be made by the Appointed Actuary. [0.5]
 - The regulator may also specify the timing of exercising such an option as to whether it is only available at inception or at any time during the tenure of the contract. [1]
 - IT Readiness [0.5]
 - Withdrawal from the option chosen [0.5]
 - The regulator might specify the treatment of the outstanding claims from an accounting purpose. [1]
 - Reserving aspects: Whether reserves beyond IBNR need to be held for the same. [0.5]
- [8]**
[36 marks]

Solution 3:

The aviation industry is susceptible to a series of risks and threats, especially with respect to technical operations of an aircraft, and the consequent dangers. Aviation insurance is a specialised insurance which has been formulated to provide coverage to the specific operations of an aircraft and other possible risks in aviation.

This offers protection against a wide array of perils, dangers, risks and damages to policyholders. Given that aircrafts are extremely prone to technical failures, accidents, terrorist activities, the usual coverage provided by different aviation insurance policies are as mentioned below -

In-flight coverage

This provides coverage against damages that can happen to the aircraft while it is mid-air (in motion). [1]

Hull all risk

This coverage is ideal for flying clubs which operate small planes, private jets belonging to celebrities/politicians/business tycoons etc. The policy covers any physical loss/damage faced by the insured plane. It also protects the plane against total loss and disappearance. [1]

Hull/Spares War Risk

Protection is provided to the insured plane and its spares in case of loss or damage resulted by anti-social activities like war, invasion, riots, hostilities, martial law, strikes, civil commotion, malicious activities and sabotage. [0.5]

Loss of License

Every aircraft crew member needs to hold a valid license. A license can be suspended on medical grounds leading to a financial loss for the crew member. This cover takes care of the financial loss incurred. The crew member can get the coverage in case of permanent total disablement or temporary total disablement due to bodily injury or illness. [1]

Spares All Risk Insurance Policy

If any loss/damage is incurred to the spares, tools, equipment and supplies of the insured aircraft or any damages caused to a property by the aircraft, it is covered. [0.5]

Aviation Personal Accident (crew member)

This cover is to protect the insured crew member against injury, disablement or death as a result of an aircraft accident/mishap. [1]

[4 Marks Maximum]

i) Every General Insurance Company needs to have a Product Management Committee (PMC) to review the existing products and discuss/recommend the new product proposals. Appointed Actuary is a key member of PMC. In the context of new product proposal and the future course of product development, the Appointed Actuary has the following critical roles to play:

- To ensure that due diligence has been carried out on the product development process – this is far more important in case of a risky business proposition as Aviation insurance
- The AA needs to play an important risk advisory role in assessing the product proposition in the context of Company's risk appetite – it is imperative to get buy in from the key stakeholders including Board if the product is much riskier than it looks at face value
- As the pricing exercise will be carried out by the Actuarial function, the AA needs to ensure the pricing in accordance with regulatory stipulations in force along with documenting all the assumptions used in product pricing and the basis of those assumptions
- To analyse the financial implications of risks covered in the product and build these into the rating of product on sound and prudent actuarial basis
- To confirm that the margins built into rates are consistent with the experience of the insurer in respect of commission, management expenses, contingencies and profit
- To analyze the impact of product on the capital and solvency margin of insurer and inform the management and board of additional capital requirement, if any, to maintain solvency margin

- Determine and inform the PMC about the data and system requirements, both at the time of underwriting and claims, to enable the company analyze the emerging experience of the product on a regular basis
- Subsequent to the pricing process, the AA should complete various regulatory requirements with respect to product filing such as completion of Technical Note and other certifications.
- To present product performance report to PMC along with recommendations at least on annual basis [8]

iii) Just as reinsurers use catastrophe models to price inwards reinsurance, cedants can use catastrophe models to assess the appropriate structure and value of their outwards programme. This assessment will include the level of vertical cover required to protect against a single severe event and the number of reinstatements required for each layer to protect adequately against multiple events. The cedant then uses the models to compare technical prices of outwards treaties and the effectiveness in risk mitigation of a range of alternative programmes. [2]

One problem that can arise here is in the use of different catastrophe models by the cedant and the reinsurer. Differences between the models may well result in one party assessing the reinsurance as good value, and another as poor value. Discussions may then revolve around the suitability of different catastrophe models. [1]

[3]

iv) Aviation Insurance has a very high exposure to potential catastrophes. Catastrophe models are a tool and do not, on their own, provide the complete answer. These are still very much a developing tool. The task of a catastrophe model is not to produce a 100% accurate result but to demonstrate the potential impact of catastrophic events on a particular insurance/reinsurance contract or portfolio.

Following any major event, modelling firms may adjust and refine their models in the light of that event and the areas in which their existing models proved to be a good or bad predictor of actual losses.

The different challenges Actuaries face while interpreting and using the output of such catastrophe models

Frequency issues:

One area that we need to consider in interpreting and using catastrophe models is the issue of frequency trends; that is, changes in frequency over time.

Example - with the exception of 9/11, in any one year, while there are relatively few total losses and/or fatal accidents, there is always the potential for a 'catastrophe.' In recent times, there has been an increase in air accidents due to various reasons.

When using catastrophe models, it is important that we understand the assumptions about these trends embedded in the models and how they have been used to modify historical frequencies. If we have a different view, we can then modify the output appropriately (for example, increasing the output frequencies if we believe the model has underestimated the effect of climate change on increasing frequency).

A further issue can lie in the volatility of the modelled frequencies, in that it should be assessed whether the parameterised frequency distribution is making adequate allowance for an unusually high or low number of events. This may be assessed either for a specific peril or across a number of perils.

Frequencies with higher return periods (although not severity assessments of known events) are very hard to back-validate. Mean reserves methods can be reasonably tested over a 5-10 year period but such validation does not work for an assessment of 1 in 100 year exposures. [2]

Severity issues:

Modelling of many components of severity trends is fundamental to catastrophe modelling. Different factors need to be allowed appropriately which could impact the event severity.

- In case of accidents where the engine failure or other technical faults are the key reasons, several safety mechanisms are put in place by the aircraft manufacturers which would eventually reduce the vulnerability
- New incidents related to terror activities also need to be suitably allowed for, a recent example was the incident of a passenger aircraft being shot down in Ukraine
- Increase in the new territories where flights are being operated
- Changes in population trends impacting exposure
- Changes in Insurer's own portfolio, for example, changes in size, mix or geographical spread
- Changes in insurance terms and conditions, for example, the imposition of increased deductibles or increased limits [2]

Model assumptions and approximations:

An additional consideration with the catastrophe models is the approximations that are introduced to make the underlying mathematics tractable and run-times practical. However, it is important that we understand these approximations sufficiently well to know what impact they will have on the particular portfolio being modelled. [1]

Data issues:

As with most actuarial modelling, the output of a catastrophe model can only be as accurate as the initial data input to the model allows. Catastrophe models rely on huge quantities of data of variable quality and so it is vital that the actuary, as user of the output, understands the data input. An additional factor is the level of detail captured within the data: the more detailed the data capture, the better the model results will reflect that specific portfolio

rather than the average portfolio. Level of details can be a challenge in case of modelling for aviation insurance.

When data is missing, many modellers select the “unknown” or “default” options. In these circumstances the model uses the inventory module to assign “most likely” exposure characteristics. We should understand the default options in the models and the sensitivity of the models to the different input options. [1]

Unmodelled elements:

Some examples are -

- Unmodelled secondary perils of a modelled loss. For example, a peculiar situation may arise where due to financial troubles a number of aircrafts are grounded and parked at the airport and unfortunately a flood like catastrophic event happens which damages the aircrafts leading to a huge loss. Such event correlation also needs special consideration which analysing the output of any such cat model.
- Unmodelled perils / territories
- Unmodelled components of a modelled loss, such as loss adjustment expenses and additional living expenses. [1]

Use of different models:

Often one way of understanding better the output of a model and deciding on how to interpret and use it is to run different catastrophe models (from different model providers) on the same portfolio and peril.

Communication:

How an actuary communicates the usage and (range of) results of catastrophe models is very important, given the amount of uncertainty inherent in such models.

Actuaries need first of all to understand and be able to communicate the assumptions being made on their behalf by the modelling firms. Unlike actuarial reserving work, where we have traditionally been concerned with the mean or median of a distribution of possible outcomes; much use of catastrophe models relies on the tail assumptions (i.e. the extreme of the distribution). Often in the tail, secondary and parameter uncertainty are much greater.

This inability to validate the projected results (as mentioned under frequency issues) highlights the importance of effectively communicating the uncertainty of results from catastrophe models. [1]

[7]

- v) As per the IRDAI Reinsurance regulation 2018, the following are the requirements with respect to the Catastrophic Risk Protection

Every Indian Insurer shall:

[1 mark each]

- ensure that its Re-insurance arrangements in respect of catastrophe accumulations are adequate;
- have the catastrophe modelling report and the basis along with return period estimates, on which the quantum of catastrophe protection is purchased for each of the perils for the forthcoming financial year duly approved by its Board;
- file a synopsis of the report along with the Reinsurance programme. [3]

[25 Marks]

Solution 4:

- i) 99.5 percentile corresponds to a return period of 200 (1 in 200 year period) which corresponds to the 50 Cr xs 200 Cr layer.

Above this layer no more capital will be required as it corresponds to the 99.5 percentile Level

Below this level the capital required will be equal to the deductible

Deductible	Capital Required
50 Cr	50 Cr
100 Cr	100 Cr
150 Cr	150 Cr
200 Cr	200 Cr
250 Cr	200 Cr

[5]

- ii)

Layer	Cost of Capital	Marginal Cost of Capital	Frequency	Severity	Loss Cost	Cost of Retention
50 cr xs 50 cr	1%	0.500	0.050	39.000	1.950	2.450
50 Cr xs 100 Cr	1.50%	0.750	0.020	43.500	0.870	1.620
50 Cr xs 150 Cr	2.25%	1.125	0.010	45.000	0.450	1.575
50 Cr Xs 200 Cr	3%	1.500	0.004	46.500	0.186	1.686
50 Cr xs 250 Cr	4%	-	0	48	0.12	0.12

Marginal Cost= Cost of Capital * Size of Layer

[1]

Frequency = 1/Return Period

[1]

Severity= Expected Severity

Loss Cost = Frequency * Severity

[1]

Cost of Retention= Marginal Cost of Capital + Loss Cost

[2]

Layer	Layer Size	Rate on Line	Cost of Reinsurance	Cost of Retention
50 cr xs 50 cr	50	5.10%	2.55	2.450
50 Cr xs 100 Cr	50	4.30%	2.15	1.620
50 Cr xs 150 Cr	50	3.00%	1.5	1.575
50 Cr Xs 200 Cr	50	2.50%	1.25	1.686
50 Cr xs 250 Cr	50	1.30%	0.65	0.12

Cost of Reinsurance = Rate on Line * Layer Size [1]

Since the cost of retention is lower for layers 50 Cr xs 50 Cr and 50 Cr xs 100 Cr these should ideally be retained. The Cost of retention for layer 50 Cr xs 150 Cr is higher than the cost of reinsurance. Hence the retention limit should ideally be 150 Cr. [1.5]

Assumptions:

EML breach is possible

Capital calculated at 99.5 percentile

Company has access to unlimited capital [0.5 marks for each point]

[9]

[14 marks]
