

INSTITUTE OF ACTUARIES OF INDIA

Subject SP1 – Health and Care Principles

November 2024 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:**a. Indemnity Commission:**

- i. Indemnity commission is a form of initial commission.
 - ii. It is a lumpsum payment to the distribution in respect of new business procured.
 - iii. It is expressed as a percentage of first premium.
 - iv. Sometimes, it may be expressed as a percentage of sum insured.
 - v. A high initial commission that insurer is paying commission in respect of premium that the insurer is yet to receive.
 - vi. This will help the distributor to develop their business as it meets their upfront cash needs such as cost of marketing.
 - vii. Such commission style provides a very strong incentive to seek new customers
 - viii. Such commission may lead to less effort on keeping existing customers by distributors.
 - ix. Typically, insurer offers such commission to distributors after checking their credit quality.
 - x. It creates New business strain to the insurer as the commission is paid in advance
- [5]

b.**(i) Impact of Indemnity Commission to all distributors:**

1. The pricing of existing products need to be revised as the current pricing allowed indemnity commission for certain category of distributors
2. The price of existing products will increase because of this.
3. The competitors may take advantage and increase their sales.
4. The volume of business from existing products may decrease because of this.
5. The new business strain will increase as it is being extended to all new business sales
6. The hunter style of distributors will increase rather than farmer style of distributors
7. Thus the long-term relationship with customers mayn't improve because of this style of commission.
8. This may lead to less persistency of long term products.
9. This may lead to damage the reputation of the insurer.
10. May also need to revise the claims experience and expense assumption.
11. If the regulatory environment disallows the future commission paid as an asset, the solvency of the insurer may be impacted.
12. Lower persistency will impact Embedded value or future profit of the insurer.
13. If the insurer is a listed company, its market value may decrease.
14. This may lead to lower investor confidence.
15. If the competitors are not following this method, it may attract more distributor network to the insurer

[7]

(ii) Impact of changing indemnity commission as a proportion of sum insured:

1. This suggestion may be suitable as the sum insured remains same throughout the term of the policy.
2. If such method is new in industry, the distributor network mayn't welcome the new method.
3. The systems may need to be changed and increase the cost to insurer.

4. This may lead to increase in higher sum insured policies in the portfolio
5. Typically, high sum insured policies are offered to young generation because of lesser underwriting.
6. This may improve the claims experience
7. May increase the profit of the insurer.
8. However, if the distributors force sell high sum insured policies because of high indemnity commission, this may lead to bad claims experience
9. This may damage the reputation of the insurer.
10. This may reduce the profit and may attract attention of regulator.

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[17 Marks]**Solution 2: Long-term care product:****a. Target market and needs met by the product:**

- i. Typically, Long-term care is essentially for people who are not going to better and is distinct from acute medical care.
- ii. It is not principally concerned with curing or alleviating medical conditions.
- iii. However, long-term care also covers a wide spectrum of needs so that people only require a small amount of assistance to be fully independent.
- iv. Thus people who are currently healthy and purchase this insurance to cover health care costs associated with any future disability.
- v. People who are already disabled and may require insurance solutions to cover the uncertain survival duration.
- vi. The long-term care typically covers living costs, housing costs and personal care
- vii. The living costs are costs incurred towards food, clothing, heating etc.
- viii. The housing costs are costs incurred towards rent, taxes etc.
- ix. The personal care costs are such costs include all forms of cost towards care that directly involving touching a person's body.
- x. This should be separated into nursing care and other forms of care.
- xi. Nursing care is the narrowest form of long term care and can be defined as care that requires the specific knowledge or skills of a qualified nurse.
- xii. Two types of funding approaches are there.
- xiii. Typically, the funding approach will be either pre-funded or immediate care products.
- xiv. In case of pre-funded, the healthy policyholders pay the premium in single premium payment mode or level annual premiums paid throughout life or upto certain age.
- xv. In case of immediate care approach, the care starts immediately after purchase of the insurance cover.
- xvi. In case of pre-funded, the benefit payment is dependent upon the claim definition, which may be triggered by a single or a multiple set of events.
- xvii. The single event may itself depend on a level of disability and its continuation for a specified period.
- xviii. Activities of daily living (ADLs) are used for trigger of claim payment.
- xix. Examples of ADLs are washing, dressing.
- xx. The number of ADLs failed denotes the level of dependency, there may be a mental impairment trigger.

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b. Interests of customer, insurers and regulators:

- i. The customer's interest is mainly influenced by:
 1. Simplicity and clarity
 2. meeting their specific needs
 3. Mode of paying the health care costs?

4. Guarantees available in the product
- ii. The simplicity and clarity mainly depends on the terms and conditions. They are mainly:
 1. Whether product offers cost of care or cash
 2. Clear definitions of Activities of Daily Living (ADL)
 3. The trigger for claims: Whether Doctor's referral or any other proof
- iii. Needs of customers:
 1. The product shall fulfil the main need of some financial protection against the costs of care and assistance when individuals become unable to look after themselves.
 2. The role of state benefit plays important role in identifying the customer need
 3. Whether the product meets the domestic care or nursing care or all types of care in case the customer is incapacitated.
- iv. Mode of paying the health care costs:
 1. Whether the product pays fixed payment or indemnifies the care cost
 2. If it is fixed cost, whether it will be lump sum or regular income during the period of care.
- v. Whether premiums are guaranteed or reviewable also plays an important role.
- vi. The insurer's interest will be based on:
 1. Marketability of the product – Distribution channels and their remuneration
 2. Regulatory acceptance – The state health benefit, regulatory restrictions etc.
 3. Adequate profitability – Affordable premium, competition in the market.
 4. Sufficient volume of the business to cover fixed costs and to pool similar types of risks
- vii. Regulator's interest:
 1. Policy terms and conditions are clear and unambiguous
 2. Product is representing reasonable value for customer
 3. Product is priced appropriately that it avoids any cross subsidy and insurer remains solvent
 4. Sales process is appropriate to the product and is not unduly influenced by higher commission or remuneration or misleading benefit illustration

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[16 Marks]**Solution 3: Pricing of CI product:****a. List of Assumptions**

Assumption	Relative Importance	Reason
Morbidity/ Incidence rates	Major assumption	The cashflows relating to benefit payment is mainly dependant on this assumption and influences the price to a major extent.
Investment return	Major assumption	This assumption mainly influences the guaranteed annuity amount payable after incidence of the claim
Mortality rate	Major assumption	The guaranteed annuity amount payable post incidence of CI is

		dependent on this assumption.
Expenses, Commission	Relatively minor	The loading is fixed in nature and the cashflows towards this are relatively small
Persistency rates and Option take up rate	Relatively minor	The annuity amount payable slightly differs

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b. Process of Setting the assumptions:

- i. Morbidity rates:
 1. As the company has been selling the CI product, own data may be used.
 2. However, the data need to be credible
 3. The rates need to be allow for advancements in medical science
 4. The rates need to allow for any change in underwriting
 5. The rates need to be adjusted for reinsurance support, if any
 6. If the own data is not credible, reinsurer's data or industry data may be adopted with suitable adjustment.
 7. The rates need to be allow for any change in distributors
- ii. Expenses:
 1. Again the expense assumption may be based on own experience
 2. Allow for expense inflation.
 3. The inflation shall be consistent with interest rates assumed
 4. Allow for expenses related to claims settlement
 5. Expenses related to annuity payment to be factored
 6. Expenses related to product development
- iii. Investment return:
 1. The investment return assumption may be different for annuity rate calculation and premium calculation.
 2. As the single premium allows to lock-in the investments, the locked-in yield can be a good source.
 3. As the annuity rates are guaranteed at inception, prudent margin shall be considered.
- iv. Persistency:
 1. Shall be based on own experience
 2. However, as single premium is being collected, there shall not be any lapse/surrender.
 3. If any lapse/surrender option is provided, own experience need to be adjusted to factor this fact.
- v. Commission:
 1. The commission payable to various distribution channels
 2. Claw back commission if any such provision is shall also be assumed
- vi. Mortality rates:
 1. Mortality rate assumption is required for assuming the survival rate for 30-days after claim incidence
 2. Other mortality rate assumption is required for annuity rate calculation after the occurrence of claim.
 3. Typically, post-claim mortality may be higher as the claimant can be considered as impaired life.
 4. Standard mortality table may be used

5. Otherwise, own experience may be used if credible
- vii. Option rates:
 1. As the product is offering option to convert 40% or 50% of sum insured into annuity, the assumption regarding the option take-up rate also required for pricing.
 2. As there is no own-experience, this may be based on marketing team feedback.
 3. May use any other source like competitors' products if any.

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c. Marketing Director's proposal:

- i. The current design will create a guarantee risk to the company as the annuity rates are fixed at the inception of contract.
- ii. Having guarantee risk, sufficient margins may be incorporated in investment return
- iii. Similarly, prudent margins will be included in post-claim mortality rates
- iv. This may result in lower annuity rates to the customer.
- v. The proposal given by Marketing Director will reduce the guarantee risk especially in terms of investment return and post-claim mortality assumptions.
- vi. At the same time, customer also may be benefited as the annuity rate will depend on the then investment return and mortality assumptions.
- vii. As the annuity is guaranteed for 5 years from there, the prudent margins will be less.
- viii. This will lead to increased annuity rate.
- ix. As such feature gives more flexibility to customer, the sales volume may increase.
- x. Such feature will give more investment freedom to insurer as there is no need to match the assets from the beginning.
- xi. The lesser guarantee may lead to lesser capital requirement.

[5]

[18 Marks]

Solution 4:

- a. Areas of Investment where regulation can be made:
 - i. Restriction may be imposed on mix of assets where investments may be made
 1. For example, mandatory investment of certain percentage in Government securities
 2. Certain percentage of investments in equities
 3. Certain percentage of investments in Corporate debt
 4. Certain percentage of investment in Infrastructure development.
 - ii. Restrictions on Exposure norms:
 1. Limits on exposure to single entity
 2. Limits on exposure to Group companies
 3. Limits on exposure to certain industry like maximum equity exposure to Banking sector entities shall not exceed X%.
 4. Limits on investments below certain rating like no investments below A rated debt instruments
 - iii. Restrictions on investments in certain type of assets
 1. For example, no investments in derivatives and Option trading

2. No investments in Art and Jewellery

- iv. Restrictions on investments for each Line of business separately.

[5]

b. Impact of change in investment in Government Securities:

- i. The relaxation of investment in Government Securities (G-Sec) will help to increase the return on portfolio by investing in risky assets.
- ii. The higher investment income may lead to reduction in premium, lower reserves if cash flows are discounted at portfolio yield.
- iii. This may lead to improvement in free assets.
- iv. At the same time, the policyholders' security may be at risk especially on long-term care benefit policyholders of company A.
- v. The impact for B mayn't be such significant when compared with company A as the impact on short-term business (PMI) is relatively negligible.
- vi. The reserves in respect of long-term CI and long-term IP mayn't be significant as they risk oriented products rather than savings oriented products.
- vii. If the regulator charges any additional capital for riskier assets, then the improvement in free assets and solvency mayn't happen and in fact may increase the requirement of capital.
- viii. For long-term liabilities, which are mainly fixed like long-term CI, the insurer may prefer to hold in government securities only for appropriate matching of assets.
- ix. If the long-term IP benefits are linked to wage inflation, the change may benefit company B to match the assets in a better way.
- x. In case of company A, if the benefits increase over time, then the change may provide opportunity for insurer to match the assets in a better way.
- xi. If the supply of index-linked bonds are limited, then the insurer mayn't have instruments to match.
- xii. A company with large free assets may utilise the change and invest in riskier assets.
- xiii. With this higher yield, the insurer with larger free assets may offer competitive prices.
- xiv. This may become challenge for small insurers or insurers with limited free assets.
- xv. More investments in riskier investment may lead to less financial security of many insurers.
- xvi. The investment strategies of all insurers may need to be relooked and the risk appetite may need to be reviewed.
- xvii. Over all the security of policyholders' may reduce and the financial health of insurers may also reduce if the mismatch of assets and liabilities among insurers increases.

[8]

[13 Marks]**Solution 5:****a. Reasons for decrease in profits:**

- i. The profit is a function of income and expenditure of the company.
- ii. The increase in outgo and decrease in income will lead to lesser profits.

Reasons for Increase in Outgo:

- iii. The increase in outgo is mainly contributed by increase in claims, increase in expenses and increase in reserves.

Increase in Claims:

- iv. The claims would have been increased by increased morbidity
- v. Increase in claims may be due to poor underwriting

- vi. Increase in claims may be due to higher retention or improper reinsurance arrangement.
- vii. Fraud also may be contributing to the increase in claims.

Increase in Expenses:

- viii. The expenses would have been due to increase in new business which would have increased the acquisition expenses.
- ix. The compensation payable to distributor would have increased.
- x. The operating expenses would have been increased.
- xi. The claims settlement expenses would have been increased.

Increase in Provisions towards policy liability:

- xii. The reserves would have been increased because of more prudence in the assumptions
- xiii. The assumptions would have been increased because of increasing the assumptions.
- xiv. There could've been change in regulations relating to provisions, which lead to increase in reserves.

Decrease in Income:

- xv. The income is mainly contributed by decrease in Premium Income and Investment Income.
- xvi. The premium income would have been decreased by higher lapses or withdrawal of the policies
- xvii. The investment income would have been decreased due to economic factors
- xviii. The investment income would have been decreased due to reduction in the portfolio or ALM strategy.

[8]

b. Morbidity experience investigation- Data requirements and approach:

- i. Characteristics of data:
 - 1. The data shall be relevant, credible and stable.
 - 2. The credibility can be checked by sufficiency of the data.
 - 3. The relevant means, the data shall not be too old. Typically, the data shall belong to past 3years or slightly more.
- ii. Types of data:
 - 1. The data required for investigation shall include policy data and claims data.
 - 2. The data shall be subdivided based on factors relevant to claim incidence such as:
 - Age
 - Gender
 - smoker/ non-smoker status
 - occupation
 - location
 - deferred period
 - 3. Ensure that the subdivided data is sufficient in volume to be credible
- iii. Cleaning of data:
 - 1. Checks should be carried out for validation and reasonability.

2. Remove any incorrect or irrelevant data
3. Validate data against external sources, e.g. reinsurer / market / population data
- iv. Approach to Morbidity rates calculation:
 1. The morbidity rates can be determined using an exposed to risk approach
 2. The exposed to the risk such as sickness, claim or recovery can be determined from the policy data and claims data.
 3. The principle of correspondence is important in the exposed to risk
 4. For data relating to recent periods, the company would need to make appropriate allowance for incurred but not reported claims in its claims data Compare actual morbidity rates to those that were expected i.e. an A vs E analysis
 5. Adjustments may need to be made if there have been changes over the period of the investigation
 6. e.g. in respect of target market, underwriting and claims management, policy terms and conditions, the economic environment, state benefits, attitudes to claiming
 7. Separate rates shall be calculated for Sickness rates, Claims inception rates and Recovery rates.
 8. These rates may further be calculated by illness and Incident year to find out any trends

[8]

[16 Marks]**Solution 6:** Risk premium Reinsurance arrangement:**a. Risk premium reinsurance:**

- i. In risk premium reinsurance, the reinsurer sets the premium, which is independent of the premium charged by the insurer.
- ii. Thus, cedant's premium rates will not necessarily require changes in reinsurance rates.
- iii. Therefore, it gives the cedant greater freedom to respond to competitor changes in premium rates.

Types of risk premium reinsurance:

- iv. There are three types of risk premium reinsurance.
 1. Level risk premiums
 2. Increasing yearly risk premiums
 3. Sum-at-risk reinsurance.
- v. Level risk premium reinsurance: The reinsurance premium is level over the term of the contract.
- vi. These premium rates may be guaranteed or may be reviewable at regular intervals.
- vii. This method has the advantage that the cedant can simply load the reinsurance charges to obtain the premium payable by the policyholder.
- viii. Increasing yearly risk premiums: As policyholder get older over the term of contract, the risk increases and the reinsurance premium also increases.
- ix. The increasing yearly risk premiums may or may not be guaranteed.
- x. Sum-at-risk reinsurance: Here the risk premium is applied on sum-at-risk rather than on the sum insured.
- xi. The sum-at-risk is usually defined as the excess of policy benefit over the reserves that the cedant holds.

- xii. The bases of reserve calculation is usually based on agreed bases mentioned in the treaty.
- xiii. This type of reinsurance is suitable only where the benefit is lumpsum.
- xiv. The sum-at-risk risk premium reinsurance is not suitable for IP and LTCI as the benefits under these policies is not a fixed lumpsum.
- xv. Such method is suitable for CI product. However, the reserves for CI is relatively small compared to the benefit amount.
- xvi. Hence risk premium as a proportion of Sum Insured or Sum-at-risk make a little difference.

[7]

b. Assessment of profitability of reinsurance treaty:

- i. The profitability of a reinsurance treaty can be assessed by comparing the profit testing gross and net of reinsurance.
- ii. Carry out profit testing gross of reinsurance.
- iii. Use the best estimate assumptions, preferably on latest experience study for carrying out gross of reinsurance profit testing.
- iv. Carry out profit testing allowing for reinsurance cashflows.
- v. Consider all the policies covered under the treaty
- vi. The reinsurance cashflows shall include:
 - 1. Reinsurance premiums
 - 2. Reinsurance claims
 - 3. Expense of managing reinsurance treaty including negotiating expenses, administration expenses.
 - 4. Investment returns.
 - 5. Project forward cashflows and discount back.
 - 6. Appropriate allowance for the reinsurance effect on reserves and capital requirements.
 - 7. Appropriate allowance for counterparty default risk capital
- vii. A suitable measure of profitability shall be selected
- viii. May use Present Value of Future Profits (PVFP) as a percentage of Premiums, or Internal Rate of Return (IRR).
- ix. In addition to the base scenario, various scenario / stress testing of the impact on the profitability may be carried out.

[7]

c. Documentation, Controls and Governance adopted for the model:

- i. The purpose of the model i.e., for assessing the profitability of reinsurance arrangement.
- ii. The filename, path and location of the model.
- iii. operational instructions / process
- iv. Review of the documentation by an independent Subject Matter Expert
- v. Controls to validate input data such as checking the policy particular any irrelevant values or abnormal values
- vi. Responsibilities for doers and checkers
- vii. Evidence of checks and sign-offs
- viii. Materiality thresholds to trigger further investigation on exceptions
- ix. Separate controls for manual data entry and automated data entry
- x. In built controls to check input totals
- xi. Reconciliation of data entered with source data either in-built checks or manual checks.

- xii. Controls to validate output results.
- xiii. Controls to ensure the output data is complete and accurate.
- xiv. Procedure for investigation of variances from calculated outputs versus prior period results.
- xv. Independent review of results using simplified version of model.
- xvi. An analysis of change (AoC) from one month to the next
- xvii. Maintenance of change log along with rationale for changes.
- xviii. Maintenance of version control

[6]

[20 Marks]
