INSTITUTE OF ACTUARIES OF INDIA

SP1 - Health and Care

November 2025 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 examiners have given credit for any alternative approach or interpretation which they consider to be reasonable.

Solution 1:

i)

a) Risk factor and Rating Factor- Risk Factor is the parameter that influences the underlying risk of exposure. Risk factors overall determine the expected claims of the exposure.

A rating factor is a measurable(quantifiable) risk factor that is used to price the risk accurately.

All rating factors are necessarily risk factors but the vice versa is not true.

If a non-measurable risk factor is important for pricing, its proxy is used as a rating factor.
[2 marks]

b) Experience rating

The approach used for determining the healthcare premium for a group contract based fully or partially on the experience of the group. [1 mark]

c) Credibility-

It is the factor between 0 and 1, which represents the proportion of the final risk premium, which is derived from experience, the balance coming from book rates. [1 mark]

d) Burning Cost

Burning cost is the estimated cost of claims in the forthcoming insurance period, calculated from previous years' experience, adjusted for changes in the numbers insured, the nature of cover, terms and conditions and medical inflation. The term can be used to describe the historic cost of claims only. The burning cost should include estimates of all claims reported but not settled and claims incurred but not reported and enough reported. [1 mark]

ii) Reason for the same may be

- Full premium may not have been earned
- Full detail of the exposure may not be available before the end of the year
- There may be some unreported claims i.e. IBNR/IBNER [Incurred But Not Reported/ Incurred But Not Enough Reported claims]
- Some claims are yet to be incurred from unexpired risk
- Expenses related to the claims may not be fully known
- Some claims may be disputed
- Claims payment may be delayed
- For profitability Investment income need to be added
- Effect of Reinsurance also needs to be factored in for profitability
- Effect of tax on profit to be considered
- Cost of capital to be considered for profitability [5 marks]

[10 Marks]

Solution 2:

i) Hospital Cash plans are defined benefit and defined premium plans

- For a low premium, insured is eligible to get a fixed pay out per day in case of hospitalization. The intent is to provide a fixed cover that can be used for incidentals, non-medical expenses etc. that is typically not covered by the indemnity hospitalisation cover.

- The benefit payout may be as low as INR 100 that can go up to INR 5000 per day of hospitalisation
- The purpose of the arrangement is cash in hand as opposed to reimbursement, thus, reducing anti-selection.
- Also, there can be a maximum number of days of benefit as per policy conditions (30,60 90 days in a policy year)
- Typically, it is offered as an optional benefit or Add-on benefit to base indemnity product.
- There can be a limit placed on pay out so that the total payout does not exceed a given percentage of base payment.
- Flexibility of use of benefit amount
- May be available in family floater policies as well
- Waiting periods apply as per base policy typically 30 days
- Some policies may have extra benefits like double amount in case of an Accident , ICU hospitalisation etc…
- Convalescence benefits may be available in some policies for extended stays in hospital
- Benefits might be available in case of hospitalization for maternity [4 marks]

ii)

Policy UW	**Inflation Index**	**Rate Change**	**Premium Index**	**Original Premium**	**Original Loss**	**Inflated Premium**	**Inflated Loss**	**Loss Ratio**
2016	1.010	0	1	140	130	140.0	131.3	93.8%
2015	1.020	0	1	120	110	120.0	112.2	93.5%
2014	1.030	10%	1	100	105	100.0	108.2	108.2 %
2013	1.041	0	1.1	160	145	176.0	150.9	85.7%
2012	1.051	0	1.1	150	130	165.0	136.6	82.8%
					Total as on 2017	701.0	639.2	91.2%

Workings

1. Inflation applied for 2017 for previous UWYs
2. Rate change as provided in the question
3. Premium index applied for in 2014 for previous two years
4. Inflated premium and inflated loss calculate using the index derived for each

The Loss ratio in 2017 for the policy is **91.2%**

Assumptions

- Policy coverage and conditions remains same for all years
- Losses include IBNR/IBNER claims
- All years are complete, so 2016 losses have not been scaled up from a partial year
- Business mix remains consistent
- Data is complete i.e. no “one-off” event in data [8 marks]

iii) Increase in premium required if loss ratio is required to bring at 85%

=91.2/85-1=7.28% [1 mark]

iv) Additional Information required are

- Projected volumes of business in 2017 (Written Premium)
- Information on unusual exposures, if any
- IBNR, particularly for 2016.
- Inflation will continue to run at 1% p.a.
- Loadings for internal expenses both fixed and variable.
- Taxes and any other levies.
- Investment income.
- For this we need to know payout pattern and premium receipt pattern as well
- as investment yields on suitable assets.
- Any changes to the product
- Impact of reinsurance
- Economic outlook
- Political change
- Cost of capital

[4 marks]

v) Reason for low inflation in the experience

- Fixed benefits
- Low benefits
- Low maximum payout in each class
- Possible increase in small amounts not being claimed
- Good claim control
- Cap on overall benefits
- Effect of increases in excesses (not raised every year) [3 marks]

[20 Marks]

Solution 3:

i) Non-Financial risks for a Health Care Insurer

1. Morbidity risk – risk that more people incur a critical illness within the term of the policy than expected (including effects of early diagnosis/screening/pandemics)
2. Mortality risk – risk that more people die within the term of the policy than expected
3. Lapse risk – risk that more people than expected lapse their policy in the early years when the accumulated value of the cashflows (i.e. the asset share) is negative or very small
4. Expense risk – risk that expenses are higher than expected (other than due to inflation)
5. Operational risk – risk that mistakes are made by staff which cause the products to lose money or be badly managed
6. Third party default risk – e.g. the risk that a reinsurer fails to make good on the reinsurance recoveries due
7. Regulation/legislation risk – risk that regulations or legislation changes, or have been misinterpreted, e.g. so that the scope of cover increases than expected
8. Tax risk – risk that the tax position changes and so the policies make less money than expected
9. Option take-up risk – mis-estimating the proportion taking up any option offered, linked to anti-selection
10. New business volume risk – Volume being higher or lower than anticipated
11. New business mix risk - if cross subsidy in pricing
12. Reputational risk – e.g. from declining claims [5 marks]

ii) Relative Merits of each proposal

Proposal A

+ simple to apply and quick to implement

+ easy to understand and explain

- does not differentiate between high risk and low risk products.

Would therefore, cross subsidise and underprice high risks and overprice low risks which would result in selling relatively more of the (underpriced) higher risk and less of the (overpriced) lower risk products if other companies' price with more sophistication

- the allowance for risk will be heavily skewed by the timing of the cashflows e.g. shorter-term policies will be much less affected than long term policies

- are only relevant for profit criteria using a risk discount rate

- challenge in estimating the correct adjustment to use

Proposal B

+ is more accurate than A in that it can allow for the different levels of risk in each product

+ therefore, more useful for making strategic business decisions

+ should be appropriate to implement with no or minimal cross-subsidy

+ can allow for all risks, not just those with a relevant assumption to model

- is less accurate than C in that the same level of risk is allowed for in every model point

- need to determine the correct allowance to make for each product

- difficult to explain – will need to be able to justify the different rates used for the different products in a way that non-actuaries will be able to understand and accept

Proposal C

+ easy to understand and explain

+ accurate – can allow for the risk in each assumption

+ accurate – will incorporate the allowance for risk into each model point

+ can be allowed for in either a cashflow model or a formula approach

+ is useful for a wider range of profit criteria, i.e. can also be used in comparison of IRR and payback period

+ can vary the margins easily by product

- cannot allow for risks not included in the pricing model – e.g. some operational risk, customer service risk

- time consuming if intending to complete a full statistical analysis to assess the correct margin to include in every assumption

- might be difficult when setting margins to allow appropriately for correlations to avoid 'double counting'

- may give the impression of more accuracy than is merited

In each case need to consider any regulatory requirements on pricing bases and also competitive considerations, the overall pricing and portfolio management philosophy that would favour or prohibit any of these options. [12 marks]

[17 Marks]

Solution 4:

i) Process of investigation analysis

- Expenses will need to be split down and analysed into the required “cells”.
- Typically, the cells may be the whole business of the insurer/ each business fund/ each main product line of the insurer
- These may be further sub-divided between regular and single premium business
- The choice of cells will vary across offices depending upon the types and volumes of business written and the purposes of the analysis
- The cells chosen should not be so small that the analysis becomes unreliable.
- Also need to split by direct costs v overheads and initial/renewal/claim/termination/investment and proportionate to premium/sum assured/number of policies
- There may be exceptions
- The investigation should exclude commission
- Record costs of medical reports and tests as external underwriting expenses

One possible approach to split these costs is as follows.

Salaries and salary-related expenses

- A large part of the expenses is staff-related, owing to the labour-intensive nature of administering the business
- In the short term, much of this may remain fixed in real terms
- In the longer-term staff costs will vary to meet changing levels of new and
- existing business and changes in services provided besides the emerging use of technology that can help automate repetitive nature of work
- The degree of automation used to provide those services will also have an effect
- Staff can be split into various groups:
- Staff whose work comes entirely within a single cell
- The costs for this group can be directly allocated to the appropriate cell
- Staff whose work comes within more than one cell
- Timesheets can be used to split the costs of this group between the appropriate cells
- Some staff will be wholly overhead and not attributing directly to sales
- Some staff will straddle both overheads and direct expenses in which case the split between the two is likely to be made pragmatically basis the time spent
- The direct part can be split further in proportion to the overall split of the other two groups

Property costs

- If the company owns the buildings, it occupies as an asset of its long-term fund, notional rent needs to be charged to the relevant departments
- This rent, plus property taxes, heating costs etc., can be split by floor space and allocated in accordance with salaries.

Computer costs

- The cost of purchasing a new computer could be amortised over its useful lifetime and then added to the ongoing computer costs
- These can then be allocated according to computer usage (or other sensible allocation method)

Investment costs

- These would be directly allocated to investment expenses and hence allowed for in assessing the investment return to be used

One-off capital costs (other than purchase of a new computer)

- The expenses analysed exclude large one-off capital costs, which need to be amortised over the expected useful lifetime of the item purchased
- The amortised cost may then simply be treated as part of the overheads If the item can be treated as an asset of the long-term fund, a notional charge would usually be made
- Exceptional items, which are not likely to recur, would be excluded completely from the analysis [10 marks]

ii)

Advantages of the suggestion

- Less hassle and allows management to focus on other areas
- Initial costs may be lower
- More certainty over expenses
- Particularly important as company is small
- Expertise provided by the third-party provider
- No or low fixed overheads – economies of scale
- Can leverage existing experience/best industry practice
- Flexible, especially for fluctuating volumes
- Easier to set pricing/reserving assumptions
- Lower expenses could mean more competitive premiums
- Lower risk of expense overruns

Disadvantages of the suggestion

- May pass profit margin to supplier
- There will be one-off system/data transfer costs
- Adverse effect on company image and possible low morale due to redundancy of staff
- Loss of control
- Uncertainty over service and quality
- which could put brand at risk
- Risk of having poor quality or no data
- Compliance issues, e.g. requirements by the regulator
- Need to manage relationship with third-party provider
- Still need to maintain link to accounting system even though services are
- obtained externally
- Less easy to implement changes
- May not benefit from future cost savings
- May not benefit from lower overhead if future business volume increases
- Lock-in contract terms may have penal termination clause
- Possibility of fee increases more than assumed at the time of re-negotiation
- Small company so may not have much bargaining power
- If renewal terms are unfavourable, it might be difficult to find another provider
- It might be difficult or costly to set up in-house services again if the company fails to renew the agreement
- Possibility of third-party default
- Many of the disadvantages can be managed through a carefully worded service level agreement and regular audits and checks
- May do client servicing in-house but outsource the administration [8 marks]

[18 Marks]

Solution 5:

i) Initial Underwriting as part of risk management

- Protects the company from anti-selection

- From lives whose health is so seriously impaired that it is impossible to assess the risk accurately
- leading to increasing frequency of claims
- and increased average cost of claims
- It enables the company to identify lives with a substandard health risk
- for whom special terms must be quoted
- or declined
- It will identify the most suitable approach and premium level for the special terms
- Adequate risk classification will help to ensure that all risks are rated fairly
- Help in ensuring that actual morbidity experience does not depart too far from pricing assumptions
- For large proposals, it helps to reduce the risk from over insurance
- Helps get better reinsurance terms [5 marks]

ii) six personal circumstances that are likely to be included under this requirement

- Address/Territory (e.g. move overseas)
- Occupation
- Personal/family health
- Hazardous leisure activities
- Alcohol consumption
- Smoking habits
- Use of drugs
- Frequency and duration of overseas travel [3 marks]

iii)

- Main savings are the costs of medical examination reports
- and the cost of the underwriter's time in assessing the reports
- The total costs normally form a small proportion of initial expenses
- Not all medical examination reports are due to sum assured exceeding underwriting limit;
- some are because of information on the proposal forms
- The prospect of higher level of underwriting limit before requiring a medical
- would attract more medically substandard applicants
- This could increase sales
- Some of these may need a medical because of information on the proposal
- forms which reduce the benefit of cost savings
- Some may obtain cover on standard terms
- This would worsen mortality/morbidity experience
- The company would then need to increase risk premiums despite the expense
- savings
- This would make the premium rates less attractive to standard lives
- They would seek cover elsewhere with a further worsening of
- mortality/morbidity experience and further increase in premiums
- As a small company, competitors are unlikely to follow this strategy
- Need to consider reinsurance implications
- The proposal would reduce the hassle factor and is likely to increase sales
- It would also reduce acceptance time
- Increase in sales would increase capital strain
- and decrease per policy expenses

- May lead to higher volatility of profits requiring higher reserves
- As a small company would need to consider what competitors were doing
- Would need to make changes to systems and internal processes
- There may be regulatory constraints
- Need to monitor experience
- Overall, the company will need to assess the balance of the extra underwriting
- expenses against possible savings elsewhere [9 marks]

iv)

For sales advisers

Relieves them of what can be a difficult and time-consuming process

Frees up time for what advisers do best – giving advice and making sales

Faster policy issue

Leads to earlier sales remuneration/commission payment

Advisers can track application's progress

If not currently widely used in the market, means of differentiation for sales advisers

If already widely used in the market, means of catching up with competitors

No change in commission but less work

They are not normally trained to ask/interpret medical questions

Some may find it embarrassing to ask personal medical questions

For Company

Leads to faster policy issue

Reduced medical evidence requirement – mainly fewer Medical Reports

Better quality risk information

Reduced non-disclosure

Fewer "incomplete" applications

Fewer "Not Taken Up" cases

Improved reputation due to high quality customer service

Audit trail for application process

Additional costs of paying nurses salaries whilst still providing same remuneration for sales advisors

and the initial costs of setting the system up

Mortality/morbidity experience likely to improve

For Customers

Skilled interview by trained staff

Interview in privacy

Avoids discomfort of discussing medical history with adviser

Better service

Better customer experience due to faster policy issue

As the interview is by phone, it will be easier for customers to choose a convenient time

Should lead to more affordable premiums being charged and fewer claims rejected. [9 marks]

[26 Marks]

Solution 6:

i) Impact on Underwriting policy of the insurer

- Since insurers will no longer be able to decline the proposals, the underwriting should be shifting from selecting the risk to managing the risk
- Insurers must develop new products to acter to individuals with all medical conditions
- This would be very difficult as having premium rates for all the conditions under the sun is not possible
- The solution will likely involve tiered products with different coverage levels and premium structures
- Increased emphasize on data analytics and predictive modelling to accurately assess the potential costs associated with different medical conditions to price products appropriately and implement effective risk mitigation strategies.
- To manage risks, increased emphasize on wellness to reduce claims, insurers may actively promote and invest in wellness programs, preventive care, and disease management initiatives for their policyholders.
- There will be expected cross subsidy (possibly increased cross subsidy) among healthy individuals and individuals with medical conditions

Impact on Pricing on Products

- The risks declined now will be charged significantly higher premium as there will not be much data available to accurately price declined risks
- Actuarial pricing models need to be revaluated for expanded risk with additional margin for increased uncertainty.
- This could lead to a general increase in premiums across the board, or the creation of specific, higher-priced pools for certain conditions
- Insurers might seek subsidies from Government as such risks known at the outset warrant much higher premium sometimes unaffordable for individuals.
- Insurers might develop innovative products with co-payment models, deductibles and limited coverage with sub limits to manage the cost to adhere to “no decline” condition
- Another alternative is to significantly reduce premium for new business with strict underwriting so that there is huge new business available to cross subsidize the declined risk coverage. [4 marks]

ii) Major stakeholders are Policyholders (existing, prospective), Insurance companies, Health Care Providers, and Government

Impact on Policyholders(Individuals)

- This will make health insurance more affordable for individuals and families
- Lower costs are likely to lead to a higher adoption rate of health insurance, as more people will be able to afford coverage
- This will contribute to greater financial protection against medical expenses
- Individuals will have better access to private healthcare services, potentially leading to improved health outcomes.

Impact on Insurance Companies

- The increased affordability will drive higher demand for health insurance policies, leading to a significant increase in sales volume for insurers
- The overall health insurance market will expand, creating opportunities for insurers to grow their customer base and revenue
- Insurers may use the tax exemption to offer more competitive pricing or enhance policy benefits, further stimulating market growth
- With a larger market, insurers may be encouraged to innovate and offer a wider range of products and services to cater to diverse customer needs

Impact on Health Service Provider (Hospitals, Doctors)

- Increased demand for health care services as more people will have access to Health Insurance leading to higher patient volumes for hospitals, clinics, and doctors.
- Healthcare providers will experience more stable and predictable revenue streams due to a higher proportion of insured patients
- Increased demand and revenue could encourage healthcare providers to invest in upgrading facilities, technology, and expanding their services
- It can also help bring down the cost due to better economies of scale benefits

Impact on Government

- The government will experience a direct loss of tax revenue from the exempted 18% tax
- In the long term, increased health insurance coverage can lead to a healthier population, potentially reducing the burden on public healthcare systems and improving overall productivity
- The tax exemption will boost the private healthcare sector, which can contribute to economic growth and job creation
- Government is likely to gain from this move in coming election as this will be popular among public boosting government's image. [5 marks]

[9 Marks]

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