

INSTITUTE OF ACTUARIES OF INDIA

Subject SA4– Pensions and Other Benefits May 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:

i)

The valuation is for the purpose of accounting. The model points should be chosen such that the results reflect the fair value of the liabilities. (1.5)

Model points should be able to capture the heterogeneity in the member profile; at the same time the number of model points should not be so high that it becomes difficult to aggregate data for such points. (1.5)

If the profile of members indicate concentration at any specific demographic, more model points are to be chosen.(0.5)

Selection of model points may be a challenge at extreme ends (eg age >90) (0.5)

The grouping can be with respect to an age bracket, past service bracket, salary ranges, membership categories, gender, etc. (1)

The construction of model points shall be consistent with the assumptions to be used for valuation. E.g. Age brackets chosen for model points could be consistent with the brackets used for attrition assumption. (1)

Model points need to capture the details of members having salaries above 1,00,000 and below it separately.(0.5)

Model points need to capture the details of members with fully accrued pensions and partially accrued pensions separately.(0.5)

Details needed for each model point include: (1.5)

- Proxy age
- Proxy past service
- Number of members
- Proxy salary or pension as applicable
- Membership category
- Gender

(Max 8)

ii) Reasons: changes in the funding status -Surplus, in this case, may arise due to one or more reasons from the following:

- a) Contributions to assets being higher than expected.(0.5)
- b) Returns on assets being higher than expected.(0.5)
- c) Reduction in obligation due to favorable experience (lower salary increments or higher withdrawals or higher deaths)(0.5)
- d) Reduction in obligation due to change in the data used for valuation- In this case actual data more fairly reflect the fund position than the model points.(1)
- e) Insufficiency of the model points data used for earlier valuation now rectified. (0.5)
- f) Random variations (0.5)

Step by step process:

- Since there is change in process followed for the valuation in the current year, re-check if all the modelling is correct and consistent with the rules of the plan (0.5).

- Check the consistency of total members between two valuation dates -total number of members used in last valuation with the numbers in current valuation allowing for movements (1)
- Construct model points based on actual data and prepare a valuation based on processes followed in the previous year. The impact on surplus due to difference in the data collection process can be estimated by comparing resulting obligations under both processes(1)
- Check the consistency of Salary, age, Past service between the two approaches in the collection of data allowing for the variations in the year.(0.5)
- If the profile of the group changes significantly while using the actual data, the impact of changes in the average age, salary etc can be compared with each model points chosen in the last year valuation.(1)
- Check the projected value of assets based on expected contribution, expected benefits and expected return on assets. The difference with the actual value of assets is the contribution of assets towards the surplus.(1)
- Since the basis of valuation is same throughout the year, there is no impact due to change in demographic or financial assumptions. (0.5)
- Difference between obligation based on expected salaries and actual salaries will give estimate of experience gains/losses due to lower/higher than expected salary increments.(1)
- Difference between actual benefit outgo on expected benefit outgo gives estimate of experience gains/losses due to higher/lower than expected decrements.(1)
- When using model points, some risk margins would have been built for the risk of incompleteness of the data not reflecting the fair value of the liabilities. Check if such margins are released in the current year on receipt of member-wise data. (1.5)

(Max 12)

- iii) While pricing the value of liabilities, the insurer's objective will be to ensure that the quoted price does not under estimate fair value of the liabilities. Hence there will be an element of prudence in his calculations. (1)

Further while quoting the price, the insurer is unlikely to get the full data of the members, scheme rules(benefits). His calculations may be based on some model points. Similarly he may be valuing major benefits of the scheme like retirement, death etc. Margins might have built for other benefits.(1)

The estimate given by insurer will be dependent on current price of pension products available with the insurer whereas valuations under IND AS 19 are prepared purely for accounting and to reflect true and fair view of obligation under the given scheme rules, assumptions, and membership data.(1) The assumptions used by the insurer will be based on the overall profile of the schemes managed by him which may differ significantly with the assumptions used in accounting valuation of the scheme.(2) eg

1. The assumptions for salary increment used by insurer may be different from the assumptions used for accounting valuation.

2. Insurer may have allowed for mortality improvement in a different manner than us ...
3. ... These assumptions cannot be known as they are priced into the annuity product.
4. The pension products (immediate annuities or deferred annuities) will include a margin for expenses and cost of capital of insurer ...
5. ... whereas the accounting valuation may be based on discounted pension cashflows which does not include any such margin.
6. The obligation may have included cost of accrual for the next year. (insurer may have sought the contributions in advance for the year)

Approaches in valuing the assets may also differ. For eg Insurer may be using book value with amortization or any other method) to price the assets; allowance may be used for quality of assets which will be different from the fair value used in accounting calculations (1)

There may be very few insurance firms to offer a quote- Higher prices may be due to less competition.(0.5)

(Max 6)

iv) Factors to be considered:

1. The insurance companies & their products are well regulated. The companies are professional risk managers & they have expertise in managing the risks relating to pension business. (1)
2. Insurance companies pool different risks & they operate on large scale. Risks relating to one company/fund are diversified. Insured funds get the benefits of economy of scale. (1)
3. But the benefits comes at a price as the insurance products will be having a margin for expenses, cost of capital & profits.(0.5)
4. When considering transfer of both assets & liabilities, some of the risks are still retained by the company. For eg salary escalation, benefit changes, membership profile changes etc. In these circumstances, the insurer will be asking fresh financing from the company. (1)
5. Different products will help to transfer different risks to insurer. Managements has to examine the different insurance products available & their suitability to its pension fund.(1)
6. While fund based products helps to manage in-service members benefits, annuity products will suit to manage pensioner's liabilities. (0.5)
7. Management needs to decide on the scope of support from the insurer. i.e only investment or investment + annuities or only annuities. (0.5)
8. Appointing the insurer to invest the assets will relieve the company from the investment and trading activities. (0.5)
9. This will also release any restrictions on the asset composition and compliance thereof as insurer's products are admissible under most of the Indian laws.(0.5)
10. This option could also be cost-effective as expenses deducted in cash-accumulation products may be comparable to admin expenses incurred on self-management of funds.(0.5)
11. Fund based products of different insurers may help to transfer the market risks relating to assets of the scheme. Past performance of the funds & the charges levied of several products of insurer is to be compared for parking funds.(1)
12. It is possible to choose more than one insurer (or more than one fund) while placing the assets of the scheme.(0.5)

13. Insurer's also provide hassle free switching of funds at a little cost to change the investment exposure to the funds.(0.5)
14. If company purchases annuities, the company can transfer the interest rate risk and the longevity risk to the insurer. This will greatly help in reducing volatility in the value of obligation. (1)
15. The company is running a large pension plan. Hence the experience is expected to be stable. Company may end up paying for insurer's expenses and margins for a much lower risk transfer. (0.5)
16. Annuity prices may or may not be competitive depending on number of insurers and industries expectation on interest rate movements.(0.5)
17. Company can save huge amount of policy admin efforts if annuities are purchased in the name of member and pensions are serviced directly by the insurer.(0.5)
18. Purchasing annuities entails irrevocable transfer of large amount of assets to insurer. Transferring assets to insurer would require liquidation of existing assets. This process can become time consuming and inopportune. (1)
19. Annuity products will not be matching exactly with pension benefits of the scheme. Either restructuring of scheme benefits or a separate fund to administer the mismatching benefits may be necessary. (1)
20. Transition phase can have administrative challenges as company needs to keep track of members for whom annuities are purchased, keeping track of varying annuity process for various member age across year of purchase.(1)
21. In case of delay/default in pension payouts, the company is still responsible for member's pension.(1)
22. Depending upon the insurance product used, the accounting of pension scheme may also differ.(1)

(Max 12)

v) Factors to be considered:

1. The ultimate cost providing the benefits, the profit/loss relating to the scheme will be known only when all the benefits are paid out & the scheme ceases to exist. But during the tenure, small(apparent) surplus/deficit are bound to exist as valuation results are based on some parameters projected to understand the future liabilities.(1)
2. The use of surplus/managing deficit arises only when the figures are substantial & stable over a period of time.(1)
3. If the company decide to use the surplus, the source of surplus needs to be ascertained. Eg if the company has contributed higher amount to the plan, the company may simply want to reduce contribution in the coming year.(1)
4. In defined pension plan, employer is meeting all risks relating the to the scheme. Hence he has the first right in using the surplus. For eg he can avail "contribution holiday" (1)
5. It is difficult to attribute the surplus to a particular group of members. Hence cross subsidies are inevitable.(1.5)
 - a. High salaried members contribute higher amounts and hence entitled for higher enhancements.

- b. Long term members have contributed to many number of years and hence have higher asset allocations.
 - c. Lower earners would expect cross subsidies from high earners.
 - d. If surplus generated in current year is used to provide benefits to older members (pensioners). Current actives would end up cross subsidizing pensioners.
6. Employees need to be educated that even though there is surplus in the current year, the amount of surplus is not very high.(0.5)
7. The impact of lifting of ceiling depends on the number of members having salaries above the current ceiling or expected to breach that ceiling at the point of retirement.(1)
8. Some or majority of the members may not be impacted by lifting of the ceiling and hence may feel left out from the benefit. They may seek benefit in some other form.
9. 3% increase in pension most likely cannot be supported by the surplus. (assuming a 10 year term of obligation, the impact of 3% increase in pension is expected to be 25% to 30% of the obligation). The employees need to be educated about this.(1)
10. Enhancement of any kind for the actives will result in similar demands from the pensioner / family pensioners. Eg 3% increase in pension if awarded to the actives, even the pensioners may demand future 3% increase along with adjustment of current pension and arrears with retrospective increase in pension. It can become challenging to handle such negotiations.(0.5)
11. Awarding increase in pension places higher weights on the cashflow further into future. The actual impact on cost of benefits would depend on extent and correctness of mortality improvements assumed for valuation. Hence the assessment of risk and cost may be erroneous if simplistic assumptions are made for mortality.(0.5)
12. If ceiling on pensionable salary is increased, there could be similar such demands every few years irrespective of the surplus position of the scheme.
13. Alternate uses of surplus (3)
 - a. Retain as risk margin
 - b. Reduce future contributions
 - c. Enhance pension for lower earning members/ pensioners
 - d. Change the valuation to buy-out basis.
 - e. Part of the surplus may be shared with members. Eg 90:10 basis
 - f. Use the assets to increase exposure to risky investment that are expected to fetch higher returns over the future periods thus reducing the cost of benefits.
 - g. Alternatively, if the surplus is due to aggressive investment approach, company can consider moving to safer assets (eg bonds) to enhance security of the benefits.
 - h. Company may think of reducing the member contributions.
 - i. Or one time refund of contributions to actives if it is decided to distribute surplus to actives.
 - j. One time bonus pension for all members if it is decided to distribute surplus to pensioners.

(Max 12)

[50 Marks]**Solution 2:**

i)

1. The ultimate cost of providing the gratuity benefits will be known only when all the benefits relating to the scheme have been paid out & the scheme cease to exist. It will take several years to reach the position. (1)
2. But an estimate of the cost is needed periodically for several reasons, e.g. for accounting, financing, compliance etc. (0.5)
3. Developing an appropriate basis is an important step in arriving at the estimate cost. (0.5)
4. If the scheme is funded, the basis aims to build up funds to provide the benefits as & when it falls due. I.e. it aims to plan the pace of funding. (1)
5. As the purpose of the valuation (in our case) is for accounting, the basis should reflect the fair value of the benefits of the scheme. (0.5)
6. Assumptions should be chosen based on the credible market data (e.g. investment return), industrial data (e.g. mortality, withdrawal) & past data of the scheme (salary growth). They should be modified suitably to reflect the future experience. (1)
7. Professional guidelines are also to be considered while developing the basis. E.g. risk-free rates are to be used when discounting the cashflows to the present time. (0.5)
8. Professional judgement & expertise is also required to decide on the risk margin either in the basis or to provide explicitly. (0.5)
9. It is likely that the actual experience will differ from the assumptions used in the basis. Hence there is a need to monitor the experience vs assumptions continuously & revise the basis so that the realistic financial status of the scheme is measured consistently. (1)
10. To help the company to understand the sensitivity of the results to the chosen basis, results could be illustrated using several sets of parameters. (0.5)
11. Basis developed on sound actuarial principles together with good quality data & method consistent with the objective of the valuation will provide results that fairly reflect the value of the benefits. (1)
12. Depending on the accounting standard, the basis will determine the amount of provisions recognized in profit & loss account or outside it.

(Max 8)

ii)

1. Assumptions used in the models shall be derived from as much relevant information as is sufficient or, if there is insufficient relevant information, as is available. Judgement is required to decide the sufficiency & relevance of the information. (1)
2. In case the assumptions are not determined by the member but received as an input for the valuation and the member has relied on the same or has not validated the appropriateness or adequacy of the assumptions, the same must be clearly spelt out in his/her report along with his views on general appropriateness of the assumptions. (1)
3. Any opinion in a report on an assumption or a set of assumptions to be used for an exercise shall include a statement about the appropriateness of the assumptions for the purpose of the calculations for which they will be used. (1)

(Max 1 mark for general guidelines)

4. Discount Rate: (Ref: 8.5.2.1)

When the accounting standard specifies that a discount rate should be chosen with reference to an appropriate term of the liabilities; due consideration should be given to a term that reflects the influence of benefit amounts and decrements assumed on that term. (1)

5. Salary increase (Ref: 8.5.2.2)

In projecting the salary increases it is necessary to keep in mind general inflation level, salary increase due to career progression of the employees and productivity gains for the organization. Where appropriate, a periodic salary experience study with the client's data should be conducted as an input for the client, when setting the assumption. (1)

6. Mortality (Ref: 8.5.2.3)

For sufficiently large schemes (say of 20,000 scheme beneficiaries or more), the past mortality experience of the scheme should be analyzed & Adjustment to the standard table is to be done based on the experience to develop the basis. For smaller schemes, where due to small size, statistically credible estimates are not possible, the member can rely more on published tables with an appropriate rating, if desired. (1)

7. Attrition/withdrawal (Ref: 8.5.2.4)

Withdrawal rates have significant impact on estimates of 'liability' but are most difficult to estimate. Withdrawal rates could be impacted by several macro-economic conditions. They differ from scheme to scheme & also vary over the years. Hence judgement is required while using & modifying the available data to reflect the future experience. (1)

(Max 5)

iii)

1. Scope & mandate given for 'peer reviewing' – if it is limited, peer reviewing may be focusing on overview of the valuation results based on model points. (1)
2. What is the 'significance' of the variation? Is there any benchmark? – Any two models that attempts to project the future figures are bound to differ. (0.5)
3. Differences in the data used in the investigations may be a source for variance. Benefit data is as per gratuity act 1972- it is well defined. Assuming the same members data & asset data is used by both the actuaries, data is unlikely to be the source of variance. (1)
4. Accounting standards prescribe PU method in measuring liabilities. Both actuaries will be using the same method in their work. But differences in using control period (eg one actuary may use longer control period) may be a source of the difference. (1)
5. Professional Judgement is required in setting parameters to ensure that the results reflect the long-term position of the scheme. Professional standards, guidance are available for the actuaries in this work. But there will be differences in their view about these parameters relevant to the scheme. (1)
6. Eg One may use single risk-free discount rate while the other may use variable rate.
7. View on salary increases both general increase & promotional increase may differ.
8. Pre-retirement exits such as withdrawal, mortality may also be a source of difference. (1)
9. Views of actuaries may differ on how to treat the statutory ceiling gratuity in their work - whether to apply this ceiling at the (future) time when it incurs or while recognizing the liability in the books. (1.5)
10. Margins for risk, errors – how to measure & allow – may be the source of variation. (0.5)

(Max 7)

iv)

1. Actuaries should recognize that the Clients are entitled to have absolute confidence in the professional skills & integrity of actuaries. (1)
2. Must also recognize the indisputable right of the client to choose the professional advisors & to seek second opinion (1)
3. The actuary should satisfy himself that he has the necessary professional expertise & complied with professional requirements before taking the assignment (0.5)
4. Both the actuaries have a duty to the Profession & to the client. (0.5)
5. If an actuary comes to know that another actuary is also involved in the same assignment with the client, they must communicate with each other to understand the nature of work, their relevant role & share the matters of concern (1)
6. While expressing different opinions on actuarial matters or while expressing opinion on the work of another actuary, due respect should be paid to the other actuary. They must not bring any disrepute to the actuarial profession. (1)

(Max 4)

v)

- o calculation of accrued amount and projected amount (2)
- o Calculation of X's ret liability (2)
- o Calculation of Y's liability (4)

Calculation of X		Liability	
Accrued gratuity	23,08,000	withdrawal liability	0
Projected benefit upto NRA	89,31,232	death liability	0
Projected benefit with ceiling	20,00,000	Retirement Liability(200000*0.2354)	4,70,826
		Total PS Liability	4,70,826

calculation of Y		Liability	
Accrued Gratuity	23,08,000	withdrawal liability(0.7036*2308000)	16,23,909
		death liability(0.0704*2308000)	1,62,483
		Retirement Liability (2308000*0.4557)	10,51,756
		Total PS liability without ceiling	28,38,148,
		Total PS Liability with ceiling	20,00,000

(Max 8)

vi)

1. For the member data given, X has recommended a liability of Rs. 4.70 lakhs while Y recommendation is Rs. 20.00 lakhs. This is significant. (0.5)
2. Data is unlikely to be source as both have used the same data. (0.5)
3. Salary escalation to project the benefit up to NRA is causing increase in Y figures. But this is not significant. (0.5)
4. Discount rate is also causing minor increase in Y figures as the discounting factors relating to Y as given int question is lower for the last 15 years (0.5)

5. Using pre-retirement exits such as withdrawal, mortality by Y is causing major increases in Y calculations. (0.5)
6. Different approaches used by X & Y in applying the gratuity ceiling is also causing major difference in reserve calculations. (0.5)
7. X believes that all members of the scheme will survive up to normal retirement. Hence he is reserving for retirement liability. He aims to reach the maximum gratuity of 20.00 lakhs at age 60. His recommended liability of Rs. 4.70 lakhs will increase gradually as the age of the member increases & reaches 20.00 lakhs at age 60. (1.5)
8. Y believes that there will be pre retirement exits & he aims to built reserves that takes care of the pre retirement exits. As the ceiling of Rs.20.00 lakhs is already reached, the reserve will not increase even if the age exceeds 40. By his approach, reserving is accelerated to earlier years than NRA.(1.5)
9. The impact of two different approaches on the scheme depends upon the overall profile of the members & how it changes over the future period. For eg if the average age of the members is young (eg 40), the difference in reserving will be significant but the gap will narrow down as the age increases & eventually converge at age 60. (1.5)
10. The impact on the scheme will also depend on the actual experience of the scheme as compared to the assumptions used in projections. If there are pre-retirement exits & actuary X revises his withdrawal basis, there could be an increase in reserves. Likewise if there are fewer exits than assumed by Y, the reserving requirements of the scheme may come down in the following years.(1.5)
11. Both the approaches will achieve that the reserves built is adequate to provide the retirement benefit when the member reaches NRA 60, provided the approaches are consistent across all members & consistent year after year. (1.5)

(Max 8)

vii)

1. Equity is a real asset class. It is expected to deliver higher appreciation in value over the long term. The increase in value will help to reduce the deficit of the scheme. The views of the Finance director are right to this extent. (1)
2. However, number of other factors are to be considered before taking a decision in this regard. (0.5)
3. Equities will be volatile over the short term. It means there is a possibility stocks going down in value & this could widen the deficit of the scheme. (1)
4. What is the attitude of the company towards this risk? What will be their convenance to finance in case the deficit widens? (1)
5. If the company is risk averse, a proper, active hedging strategy must be in place to manage the short-term volatility. (e.g. use of derivatives) – This will require expertise & involve additional expenses which dilute the higher returns. (1)
6. We need to consider the profile of the scheme & to what extent the assets are matching the benefits in terms of nature & term. (0.5)

7. For example, if the scheme is matured and large payouts are expected over the next few years, security of the benefits will be prime concern. Increasing the equity exposure will impact this objective adversely. (1)
8. If the scheme is young, there is scope for increasing the equity exposure as there is more time to deliver returns & to reduce deficits. (0.5)
9. Asset Liability study (ALM) is to be considered to understand the matching of the existing portfolio & risk-return delivered in the scheme. (1)
10. Study on how the matching & the risk return characteristics will be altered when increasing the equity exposure will have to be conducted. (1)
11. Several simulations involving various equity exposure are to be done to understand the risks & rewards. (0.5)
12. Liquidity will be important if more cash outflows are expected. By choosing listed stocks this risk can be controlled. (0.5)
13. Also, we need to consider other alternatives to control the deficit: For e.g. investment in highly rated corporate bonds OR (Equity)fund-based products of insurers to achieve higher return. (1)
14. It will be prudent if the increase in equity exposure takes place gradually over the period. (0.5)
15. Investment expertise, the expenses associated with active management of the portfolio Compliance requirements are other factors that needs to be considered before deciding on this issue. (1)

(Max 10)
[50]
