

# **Institute of Actuaries of India**

## **INDICATIVE SOLUTION**

**November 2011 Examination**

### **Subject SA4 – Pensions & Other Employee Benefits**

#### **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

**Answer (1a)**

(i) The beneficiaries are:

- In service employee members
- Retirees

(ii) Mismatch between contributions and benefits:

- Contributions relate to gross salary and benefits relate to basic salary
- No benefits available in case of resignation from service
- No benefits available in case of non-eligibility due to non completion of 10 years of service (
- Contributions are made only for service post scheme commencement whereas in determining benefits entire service is reckoned

(iii) Issues arising due to various organizations participating in the scheme:

- Salary scales would be different for different retailing organizations
- Organizations have different philosophies for salary increments
- Salary interrelationships have a great chance of changing from time to time
- The above can enhance in a big way the mismatch impact
- Each organisation's employees are potentially exposed to other organisation's risks related to withdrawals and mortality as well

(iv) Discontinuation of contributions by some organizations:

- This creates doubts about long term continuity of the scheme
- Younger members opting out while older members continuing
- This further enhances the mismatch impact

(v) Concerns of younger employees:

- Their contributions are used to provide disproportionately large benefits to older employees
- In case of leaving service there is total loss-this is serious limit
- Eligibility condition of 10 years may be seen as unfair for death and disability
- Level of benefits may look low for early deaths and disability cases
- May have concern about organizations adopting discriminatory salary fixation policies to suit the interest of their own employees

(vi) Concerns of members who discontinued contributions:

- The scheme design does not clearly spell out the position of such employees
- Probably, they may get treated on par with employees leaving service early or alternatively as there seems to be implicit agreement for retention of monies in the fund, some sort of penalties might be being levied
- Either way it will be considered as harsh
- There is no option to collect immediate cash and to walk out of the scheme

(vii) Concern of retirees:

- The concern about younger employees opting out of the scheme
- This creates doubt about continuity of benefits in the long run
- Worry about possible restructuring of the scheme which may not take care of their interest

**Answer (1b-i)****(i)**

- ✓ Need to do (a) funding valuation and (b) Discontinuation valuation. These need to be done on realistic assumptions and conservative assumptions
- ✓ The valuation should investigate the standard contribution rate requirement as well as the funded status.
- ✓ With the nature of the scheme and the requirement to test the viability of the scheme, the valuation method to be used for the funding valuation should be on a prospective basis.

**(ii)**Setting up of assumptions:

➤ This calls for following studies:

- ✓ Salary escalation experience
- ✓ Early leaving from service experience
- ✓ Experience about discontinuation of contributions by members
- ✓ Mortality experience of in service employees and of retirees
- ✓ Investments in various asset classes and yields being earned
- ✓ Experience of early leaving and salary escalation will have to be preferably analyzed separately for each retailing organization
- ✓ Alternatively organizations can be grouped in 3-4 subgroups for the above study, depending upon the noticed common traits

➤ Following to be kept in view in setting up of assumptions:

- ✓ In determining salary escalation assumption and early service leaving assumption, actual experience study will be the guide
- ✓ In mortality assumption, as the data may be small the relevance of standard tables would be significant
- ✓ Discounting rate may be firmed up keeping in view investment philosophy, yield on current portfolio and expected yield curve or the long run

**(iii)** Study viability of the scheme as ongoing one for entire group as one entity. Also study viability separately for 3-4 subgroups of retailing organizations –such subgroups being formed to ensure broad compatibility of salary and age profile and early leaving environment within each such sub-group. For such a study, notional allocation of assets for each such sub-group will have to be worked out. Such a study will give a feel of extent of cross subsidization occurring within different organizations.

**Answer (1b-ii)**

**(i)** To check the adequacy of contribution rate of 12% of gross salary to achieve target normal retirement pension for customary entry ages. This should be done separately at least for each sub-group by using assumptions relevant to the experience of each such sub-group.

**(ii)**To consider suitable modification of entry point contribution rates based on the above study

**(iii)**On the basis of funding valuations (attained age basis) carried out for entire group and for sub-groups, check adequacy of 12% contribution rate for the entire group and separately for sub-groups

(iv) On the basis of funding valuation exercise, consider moderation of 12% contribution rate for different sub-groups

(v) Also consider if moderation of contribution rate for existing members can be possible for various age groups within each sub-group

(vi) Evaluate the alternative of maintaining the contribution rate but to moderate the pension benefit scale to vary according to the funding valuation status of each sub-group

(vii) Take a look at pensions being paid to current retirees. Check the value of benefits already received and that are likely to be received hereafter and compare them against the level of contributions made while in service by the retirees. Evaluate the level of mismatch. Can there be some moderation possible in the already released pension benefits?

(viii) Evaluate the cash option issue. Is it stress on the fund? Is it causing early flight of funds and thus endangering the benefits for those who choose pension format of benefits?

(ix) Consider if cash option can be replaced by “commutation + pension” approach?

(x) Consider introduction of benefit in the event of ‘early leaving of service’

(xi) Consider introduction of improvement in early death or disability benefit as this will not cost much and will be in the interest of younger members

(xii) Consider changing the benefit accrual formula

(xiii) Consider the impact of increasing the retirement age

### **Answer (1c-i)**

#### **Merits--**

(i) The current scheme lays down a fixed contribution rate of 12%. The scheme is entirely financed by employees’ contributions. It is also defined benefit in nature. There is a built in conflict as DB scheme requires variability in contribution rates as may be needed to support Defined Benefit scales. Viability of both benefit structure and contribution structure cannot be maintained under current arrangement. DC scheme will provide an option to get out of this mismatch.

(ii) Scheme is financed out of employees’ contributions. Hence cross-subsidy becomes less acceptable. DC scheme will eliminate cross subsidy issue.

(iii) Under current arrangement, funding adequacy is volatile. DC scheme will provide an escape from this.

(iv) Scheme structure will be seen by employees as more transparent as each employee will know what he is contributing and what he gets

(v) Early leaving service benefits can be better handled.

(vi) Investment opportunities can be explored more aggressively by providing investment options to members

**Demerits**

- (i) Under DC scheme, no certainty of precise pension benefit amount
- (ii) Formula linkage with final salary will be snapped
- (iii) Member individually carries the risk of investment both as regards capital value and growth
- (iv) Member carries the risk of future variations in annuity prices
- (v) Abrupt changes in salary structures can destabilize the target link with final salary and earned pension

**Answer (1c-ii)**

- (i) The existing fund will have to be notionally allocated to existing in-service members and to retirees
- (ii) As the scheme is to become a DC scheme, notional build up of accumulation of contributions for each member/retiree will be an important benchmark to look at
- (iii) Another important benchmark will be the present value of accrued benefits under the existing DB scheme
  - Assuming future salary increases
  - Ignoring future salary increases
- (iv) One more benchmark will be the notional credit required in the account of each member to ensure eventual expected final salary pension (attained age valuation)
- (v) For younger employees, 2 above may be a better starting point
- (vi) In case of older employees-particularly those nearing retirement-it may be necessary to strike balance between 2, 3 and 4 above
- (vii) In case of current pensioners, one may have to consider the possibility of pruning of benefits if overall funds call for sacrifice all around
- (viii) To evaluate the current fund and to compare available asset value against 2,3 and 4 above. If current asset value is well above the adequacy level, then there can be more liberal approach possible for current pensioners and for those in-service members who are nearing normal retirement.
- (ix) In the extreme case, the Federation may need to appeal to the employer organizations for top up contribution to the Fund to make up any shortfall to support the transition to DC and to ensure adequate level of benefits secured for the existing retirees. This may be very difficult but needed to balance the needs of the retirees and active employees.

**Answer (1d)**

- (i) It gives to the Federation control over funds for a much longer period i.e. right up to the death of the member/beneficiary
- (ii) In this environment the scheme will have investment for the accumulation phase as well as for the disinvestment phase. As the investment consideration for each phase will be different, it will be worthwhile considering separation of fund, for investment purposes, for in service members and for retirees. This will facilitate adoption of suitable strategies.
- (iii) In the disinvestment phase there will have to be greater emphasis on liquidity, security and duration matching (of assets & liabilities) while attempting to maximize the yield. There will be stronger orientation for high quality (primarily G-Sec), high coupon long term debt.
- (iv) A regular Asset liability matching exercise will be needed for disinvestment phase
- (v) A strong discipline on monitoring the cashflow position of the scheme is very important. The asset liability study will also highlight any shift in balance of how much of the regular contributions are needed for the ongoing retiree payments versus being able to invest for the accumulations.
- (vi) The scheme will take investment, longevity and expense risks but will save profit margin of insurers.
- (vii) The scheme will need to estimate the amount of fund required to be transferred from accumulation phase fund to disinvestment phase fund for which it will use a set of annuity factors. Such factors will need periodical monitoring.

**Answer (1e)**

To consider whether a benefit should be purchased from an insurer or paid out of the fund, following needs to be considered:

- Whether insurers are offering such benefit
- Whether the benefit can be paid out of the fund

If answer of any one is “No”, the other one has to be adopted. For example, if insurers are not offering the benefit, then it needs to be paid out of the fund. Similarly, if the benefit cannot be paid out of the fund, e.g., if the scheme had not got special dispensation, then pensions had to be purchased from an insurer.

However, where answer of both (i) and (ii) is “yes”, then we need to consider:

- How risky is it to pay a benefit from the scheme i.e. the variability of the benefit outgo. If it is very risky, say there are very few pensioners, then scheme should consider to purchase from an insurer.
- Whether the benefit is available at a competitive price. If yes, then it should consider to purchase from an insurer
- The risk/return or Cost/Benefit analysis

Any additional benefits offered by insurers. For example, insurance companies offer wide variety of annuity options—such as annuity for life, annuity for a guaranteed period and for life, annuity for joint life and last survivor etc. The choice can be of great value to retiring member

In the present case Federation has got special permission to pay pensions. As the scheme is 15 years old, the number of pensioners is expected to be reasonably large and hence whether the scheme should purchase pensions from an insurer or should pay out of fund will depend on the cost/benefit exercise.

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2 (a)

**i) Key points to be considered:**

- Gratuity is a final salary defined benefit scheme
- It might be a small scheme as only senior executives are covered
- Benefit per member may be quite large particularly for those who have put in longer service and also due to no upper limit.
- Gratuity is payable immediately in lump sum on exit provided 5 or more years' service has been put in
- In case of death or disability and normal retirement benefit is payable irrespective of Service put in.
- In view of the above liquidity is important as even a single claim may be large enough
- Investment policy should take into account the pattern prescribed by regulations for approved schemes
- Trustees own attitude to risk should be considered
- The ability & willingness of the employer to pay in case of shortfall due to price fluctuations of equity
- Average future service may not be very long as the scheme covers senior executives only where age should be relatively higher
- The scheme should thus be backed mostly by short & medium term fixed interest type investment
- A small proportion of investments may be held in equity for longer term liabilities due to salary link
- It is on the assumption that scheme is funded on ongoing basis
- Funding level of the scheme is 85% only requiring more restrictive investment policy

**2(a) ii) Implications on scheme's funding principles due to change in investment strategy:**

- The current funding plan is based on returns commensurate with 45% G-Sec, 35% high quality Corp bonds, 10% equity and 10% cash. So any revision in investment strategy may need revision in investment return assumption
- Or the revised strategy may be assumed for a short period, reverting again back to current asset split
- May also retain the current funding basis as a prudent margin
- But future valuation results are likely to be more volatile due to mismatch of actual assets and liabilities measure
- Though expectation of out performance of equity may give rise to surplus
- Trustees may require the employer to agree to a shorter recovery period in return for higher risk investments

- Or may require promise from employer for a short term cash injection particularly if a large claim arises when equity market is now
- Or the scheme might have a mismatching reserve
- Or may require margin in assumptions/ technical provisions
- Stochastic asset liability modeling in setting the funding plan may also be considered

2 (b) Since all three actuaries are using the same data of members & assets and same methods, the differences in result would be due to differences in assumptions.

**Further assumptions required:**

- Normal retirement age (NRA)- let it be 60
- Simplifying assumptions- we assume to perform calculations using gaps instead of accurate division ( $1.085/1.06=1.0236$ )
- Let coupons and dividends are payable annually in arrear with next coupon/ dividend payable in a year
- Commutation is at rates at which annuities are purchased

**Actuarial Liability (AL):**

Trustee Actuary:

We may assume the AL worked out by trustee actuary (i.e.  $AL_1$ ) be 100. This is because we need to work out AL calculated by other actuaries relative to it.

Company Actuary:

Pre-retirement gap is 3% (9%-6%) compared to 2.5% (8.5%-6%) of the trustee actuary. AL will thus be lower by a factor of  $(1.025/1.03)^{18}=0.9161$

Post retirement gap is 5% as against 4% of trustee actuary. So AL will be further lower by around 10% (based on commonly used thumb rule that a decrease of 1/2% in i-pinc leads to an approx increase in liabilities by 5%)

Further there is no change in retirement age as early retirements have been taken as 'Nil'

Hence with combined effect AL will be

$$AL_2 = 100 \times 0.9161 \times 0.9 = 82.45$$

Trade Union (TU) Actuary:

Pre-retirement gap is 2% (8%-6%) compared to 2.5% of Trustee Actuary

Further there is no change in retirement age.

This increases AL by a factor of  $(1.025/1.02)^{18} = 1.0920$

Post retirement gap is 3.5% as against 4% of trustee actuary. So AL will be higher by around 5% (again by same thumb rule)

With the combined effect of all

$$AL_3 = 100 \times 1.0920 \times 1.05 = 114.66$$

Actuarial Value of Assets:

As per the trustee actuary the actuarial value of different assets of the scheme is

$$V \text{ Sec}_1 = 80$$

$$V \text{ Eq}_1 = 15$$

$$V \text{ Cash}_1 = 5$$

$$\text{Total } (VA_1) = 100$$

The cash will be taken at its face value by all the three actuaries so its value will be 5 for all.

Company Actuary:

He will put value of G Sec as

$$V \text{ Gec}_2 = 80/100 (8.5 \cdot a_{10|} @9\% + 100 v^{10} @9\%)$$



$$=80/100 (54.550+42.241) = 77.43$$

And value of equity as

$$VEq_2 = 15 \{4.0/(9.0-5.5)\} = 15 \times 4.0/3.5 = 17.14$$

Hence actuarial value of assets calculated by company actuary will be

$$VA_2 = 77.43 + 17.14 + 5 = 99.57$$

T U Actuary:

He will put value of G Sec as

$$\begin{aligned} V Gec_3 &= 80/100 (8.5 \bar{a}_{10} @ 8\% + 100 v^{10} @ 8\%) \\ &= 80/100 (57.036 + 46.319) = 82.68 \end{aligned}$$

And value of equity as

$$V Eq_3 = 15 \{3.0/3.5\} = 12.86$$

Hence actuarial value of assets calculated by TU actuary will be

$$VA_3 = 82.68 + 12.86 + 5 = 100.54$$

The results may be summarized as under:

	Trustee Actuary	Company Actuary	T U
Actuary			
Value of assets	100	99.57	
100.54			
Value of liabilities	100	82.45	
114.66			
Funding level	100%	120.76%	
87.69%			

## 2 (c) Reduction factor in case of early retirement:

Presently no reduction factor is applied and hence any reduction factor to be used now will reduce early retirement pension and will be less generous for employees.

The role of the trustees is to

- Comply with legislation,
- Enforce the trust deed & rules (TD&R),
- Protect rights of all the members and
- Fulfill employer needs if above are met.

So first we need to check whether TD&R permit reduction factor to be applied, or that they need to be amended.

In case of amendment whether employer needs to be consulted. If consent of employer is required, then amendment might need approval of company's Board.

In India there is no legal restriction on reduction factor to be applied.

However, as a minimum employees' accrued benefit should be protected on early retirement which means they should get at least actuarial equivalent in value of their short service pension entitlement.

Actuarial Equivalent will also be cost neutral if it is calculated on realistic basis.

A 3% reduction will be more generous compared to actuarial equivalence.

We may need to review the assumptions currently adopted for funding as a result of this benefit change, i.e.

- Does the existing provision of no reduction encourages members taking early retirement more
- Will actuarial equivalence or a 3% reduction would result in discouraging early Retirement
- If so, how much
- Also whether use of a reduction factor would result in reduction in the value of the on-going active liability and how much

From employer's perspective, it has to be seen whether employer wants to encourage or discourage early retirement within 5 years before NRD.

- If it wants to discourage, then actuarial equivalence may be an option
  - If it wants to encourage, then 3% reduction or even no reduction may be preferable
  - If it wants to have its control, then employer's consent may be introduced if it is not there already
  - In any case early retirement on ill-health grounds, particularly subject to medical tests may be permitted without a reduction factor
  - Overall the employer may be interested to know the realistic cost due to benefit change, effect on administration of the scheme, effect on employee satisfaction and the consistency with its employment plans
  - A realistic cost can be assessed by projecting the effect on retirement patterns and valuing in a realistic manner the difference between benefit cost before and after the change. For administration there will be a small onetime cost in changing the calculation procedures
- The liquidity of the scheme should improve as any reduction factor- whether 3% or actuarial equivalence should discourage early retirement

2 (d)

i) **Describing the funding methods:**

Projected Unit Method (PUM):

The projected unit method aims to keep the value of the assets in line with the value of the liabilities that have accrued to date, allowing for projected salaries. If the assumptions are borne out, the on-going contribution rate will be equal to the value of the benefits accruing, allowing for projected salaries.

A Standard Contribution Rate (SCR) is calculated to cover the value of the benefits accruing over the next year. However, it is modified (known as modified contribution rate), if required to take account of any surplus or deficit that may exist in respect of past service

Attained Age Method (AAM):

The attained age method makes the same comparison of assets with past service liabilities. However, the SCR in respect of future service is set to be a level percentage over the future working lifetime of the active members. Again the modified contribution rate will be adjusted to reflect any surplus or deficit in respect of past service.

Comparison of two methods:

PUM requires lower contributions initially when projection period is longer. The contributions increase as the projection period shortens. The AAM, on the other hand, aims to keep contributions stable irrespective of the projection period.

The contributions payable under AAM are higher initially when compared to PUM. Similarly they are lower than PUM in the subsequent years. Thus the funding method makes difference of timing of contributions and not their value.

AAM results into higher level of funds into the scheme than required and hence enhances security of benefits for members. But at the same time it may be criticized as it may be detrimental to employer's business objectives.

Justification for change in method:

The AAM is considered to be ideal for closed schemes as it considers the current set of members as a closed group. It calculates a level contribution rate to cover their future benefits. As the scheme is closed to new entrants and is a closed group now, the AAM is more suitable and will result in a more stable modified contribution rate.

The PUM, on the other hand, is more suited to an ongoing scheme as it implicitly assumes the membership profile will remain constant, for a stable contribution rate.

If PUM is continued to be used, it would probably result in a steadily increasing contribution rate.

The security of members' accrued benefits will be higher under AAM.  
PUM may still be used if employer has no problem with increasing contribution rate in future.

2 (d)

ii) **How valuation assumptions are set:**

The starting point is normally the last valuation and hence it is preferable to stick with the same basis so that the results are consistent from one valuation to the next.

However, the assumptions should reflect the expected experience of the scheme in future.

This means the assumptions need to be adjusted for

- Any change in market conditions, e.g. inflation or interest rate movements
- Happening of any significant event, e.g. scheme closed to new entrants

The adjustment in assumptions is required when it is believed that previous assumptions are no longer appropriate for future.

**Why modifications made:**

As the scheme is now closed to new entrants, the long term investment strategy is likely to change, e.g.

- Shorter period to invest, or
- Tighter cash flow restrictions

Also the labour problem within the company is indicative of

- More withdrawals
- Declining industry which means lower pay rises in future
- Pressure on company management may lead to higher pay rises
- Any other possible changes

2(d)

iii) **Different ways for funding the deficit:**

This depends mainly on the circumstances of the company or precisely on affordability of the company.

The possibilities include:

- Paying a lump sum now or paying it off gradually
- But definitely within the working lifetime of the members
- The extra contributions may be salary related (a % of salary) or fixed monetary amounts

It is common to increase the contributions as a percentage of salary. However, care is needed in a closed scheme when if the company shrinks quickly, the contributions may fall short.

2 (d)

iv) **Other means to mitigate the effect of valuation results:**

In the short term:

It needs to be understood that the valuation method and assumptions do not have any direct effect on the ultimate cost of the scheme.

The valuation results (method & assumptions) help to set the pace of funding for the benefits. If the company wants to pay the less in the short term than more realistic/optimistic assumptions may be used.

Alternatively, a method other than AAM, say PUM with a longer control period than one year, may be used.

In the long term:

The company management should talk to members and some long term solution should be found.

Discretionary pension increases may be reduced or stopped.

The benefits for future service can be reduced.

Or, employees can be asked to contribute, if they don't contribute or their contribution can be increased, if they already contribute.

Or, future accrual of benefit may cease.

Or, the scheme may even be wound up.

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