

# **EXAMINERS' REPORT**

*November 2012 examinations*

## **Subject F104 — Pension & Other Benefits Principles**

### **INTRODUCTION**

The attached report has been prepared by the subject's Principle Examiner. General comments are provided on the performance of candidates on each question. The solutions provided are an indication of the points sought by the examiners, and should not be taken as model solutions.

## Question 1

*This question was straight-forward bookwork and was reasonably well answered.*

i)

- It is based on population data rather than scheme membership
- It is unlikely that individual data will be available, or that projections will be made at an individual level.
- The funding position or the asset values may not be relevant
- Projections are usually on an open membership basis, allowing for future new entrants, rather than just considering current members and their accrued rights.
- No fixed idea of a “member”, a “deferred member” etc. – membership will vary with employment, unemployment etc. throughout an individual’s career, with people moving back and forth between groups.

ii)

- Mortality improvements
- Future fertility
- Future migration
- Price inflation
- Earnings inflation
- Rate of pension increases
- Age of retirement
- Invalidity rates

## Question 2

*Part (i) was reasonably well answered. The calculations were poorly done, even though they were a direct application of formulae from the core reading.*

i)

Early retirement:

- Members withdraw the benefit before normal retirement age
- Treatment of the option will take into account the fact that the benefit is paid earlier and for longer
  - Benefits would be determined in relation to what a member would have got if they:
    - stayed until the benefits would normally fall due
    - Remained as a member without accruing further benefits
    - Ceased being a member altogether
  - The assumptions used are influenced by the approach chosen
  - Usually in the form of a reduced pension paid
  - Equation of value such that the value of the early retirement benefit equals the value of the benefit accrued to date

Late retirement:

- Members remain in employment after normal retirement age
- Can:
  - Work and draw a benefit
  - Continue to accrue benefits in the normal way
  - Leave the scheme and defer receipt of the pension

- If the last option is taken pension will be increased to take account of the fact that the benefit is paid earlier and for longer
  - Benefits would be determined in relation to what a member would have got if they:
    - stayed until the benefits would normally fall due
      - Remained as a member without accruing further benefits
      - Ceased being a member altogether
  - The assumptions used are influenced by the approach chosen
  - Usually in the form of an increased pension paid
  - Equation of value such that the value of the late retirement benefit equivalent to the normal retirement benefits

ii)

Value of the early or late retirement benefit is generous, encouraging more members to take the option. May have cost implications for the fund.

For both options, risks can be by:

- ensuring value of the benefits granted when the option is exercised is equivalent to the value of the standard benefits
- Require consent of employer, scheme managers or both.

iii)

Value of normal pension at 65 =  $2\% \times 25 \times R300\,000 \times 15.7543 = R2\,363\,145$

Value of normal pension at 67 =  $2\,363\,145 \times 979\,505 / 998\,000 \times (1.075)^2 = R\,2\,680\,300.05$

Value of enhanced pension at 67 =  $2\% \times 25 \times R300\,000 \times 1.312 \times 13.6194 = R2\,680\,297.92$

iv)

Value of enhanced pension at 67 with extra service =  $2\% \times 27 \times R300\,000 \times 1.312 \times 13.6194 = R2\,894\,721.75$

Cost at age 65 =  $(2\,894\,721.75 - 2\,680\,297.92) \times (1.075)^{-2} \times 998\,000 / 979\,505 = R189\,051.45$

### Question 3

*This question is straightforward, but was poorly answered in general, with many candidates being unable to generate enough valid points, particularly for part (i).*

i)

Defined benefit pension:

Benefits:

At retirement:

- Pension paid at retirement
- Net replacement ratio at retirement age known in advance
- Benefit level based on length of service – member knows what to expect if they stay till NRA
- Member is guaranteed a benefit that maintains its relationship with the member's salary – and hence inflation – to the extent that the member's salary increases with inflation
- After retirement:
- Benefit increases of 100% of CPI are known in advance, and guaranteed.
- Spouse receives a 50% pension on the death of the member – known in advance and guaranteed

Contributions:

- Member contribution is usually a fixed percentage of salary.
- Employer pays balance of cost – contribution rate not fixed, fluctuates depending on experience and membership changes.
- Employer guarantees (sponsors) the level of benefits.

Defined contribution provident:

Benefits:

At retirement:

- A lump sum is paid on retirement
- The value of the lump sum is the accumulation of:
  - Member and employer contributions towards retirement
  - Investment returns on the contributions
  - Less any expenses that are deducted in the running of the fund
- Actual amount of lump sum not known in advance
- Actual amount of lump sum not guaranteed
- The level of income per month that the lump sum will provide is not known in advance
- Not known if the purchasing power of the benefit is protected

After retirement:

- Lump sum at retirement is all that is available to secure standard of living during the period of retirement – including escalations and spouse's benefits. The lump sum would need to be applied to provide all these benefits.
- May need to secure an annuity at retirement – insurer costs would need to be provided from the lump sum.

What will happen to the benefits on withdrawal or death?

Contributions:

Member and employer contribution rates known and the employer rate is also usually fixed.

- How will the contribution rate for the employer be set? Will the aim be to target the same level of benefits under the DB arrangement?

ii)

Investment strategy should be reassessed in the light of:

- Member exposed to the full investment risk. The risk versus reward balance still applies, but the risk aversion of members would need to be considered.
- Individual members will have different approaches to risk
- Fluctuations in the market values of the assets and investment returns directly impact the value of the member's lump sum.
- Is the investment strategy appropriate for all ages of member?
- Is it prescribed or is it appropriate to include an element of choice for members?
- Considerations as to whether to change investment mix closer to retirement – for capital protection purposes.
- Investment strategy post retirement will also be an issue now for the retired member, which it was not previously.

iii)

- Under the new arrangement, the member loses a guaranteed level of benefits
- Longevity, investment risk are now carried by the member
- The implications of these changes need to be clearly explained.
- Any transition arrangements for members already in the scheme.

#### Question 4

*This question is fundamental to the understanding of the course material, and was extremely poorly answered by many candidates.*

i)

AA method – targets a stable SCR. Underlying cost of the accruing benefit will be lower than the SCR for the first years, and then as the cost of each years' service increases, the SCR will drop below the cost of each years' accrual.

The accrued liability of the AA is the present value of the accrued benefit to date, allowing for full salary increases to NRA. If the SCR is paid, surpluses will build up in the initial years, and as the cost of each years' accrual increases to above the SCR, the surpluses will be used up by such that the benefit is just funded by NRA.

CU method – targets a stable fund, but the funding level targeted is such that the present value of all benefits accrued at the valuation date, based on current earnings for members in service is funded.

The SCR under the CU method starts low in the early years of accrual as future salary increases are not funded. Each year the SCR is set such that it pays the years' additional accrued service, as well as allowing for the year's salary increase on the previously accrued service. The SCR will then increase as the scheme ages and the larger portion of the SCR will ultimately be the revaluation of the AL, as the AL grows.

ii)

The most significant assumptions given are the salary increase rates and the discount rates.

The differential between these two assumptions gives an indication of the relative strengths of the two bases.

Blue Bank has a differential between these assumptions of 2.5%. The differential is 3.25% for Green Bank. This implies that Blue Bank has a stronger basis.

Blue Bank also provides for greater pension increases, which will also result in higher ALs. The weaker basis for Green Bank would imply even slower funding of the benefit initially, and higher rates later.

It may be considered that the basis Green Bank is too weak, and will not provide enough security for the provision of benefits, when taken in conjunction with the slower pace of funding. The Blue Bank is targeting full accrual of benefits, on a stronger basis, with funding being faster early on, so is perhaps a less risky approach to funding the benefits.

iii)

Stability – the SCR under the AA method is targeted at being stable. A higher rate is paid upfront, when compared to the underlying cost of the accruing benefit, such that this rate can be maintained throughout the full period of benefit accrual. The rate will only be modified to the extent that experience differs from reality.

The SCR of the CU method is not expected to be stable. It will increase as the fund matures. The element of the SCR that relates to the revaluation of past accrued benefits, to allow for salary increases, will become an increasing portion of the SCR. This will be impacted by the level of salary increases, and will impact the stability of the SCR.

Security – the AA method is considered to be more secure. The full accrued benefit, allowing for future increases to salaries is fully funded. Surpluses have built up in the fund, and these are evidence of the faster funding inherent in the AA method.

The CU method is considered less secure. The SCR will increase, and the risk exists that the full SCR becomes unaffordable for the sponsor, and the security of benefits may then be compromised.

Both funds are 110% funded, which would suggest they are equally secure. However, given the stronger basis for the Blue Bank Pension Fund, it may be considered to be in a more sound financial condition than the Green Bank fund. Also, the liabilities of the Green Bank fund that are 110% funded are only those allowing for salary increases to date, whereas the liabilities in the Blue Bank fund allow for salary increases to retirement age. If the Green Bank were to revalue its liabilities allowing for full salary increases, there is a chance that it may not be 100% funded, and therefore the funding level is potentially misleading, when taken on its own.

AL from Blue Bank Pension Fund:

$$16 * 0.02 * 1 * (1.085)^{-25} * (1.06)^{25} * 14.218 = 2.540338939$$

Service in Green Bank Pension Fund:

$$2.540338939 / 1.15 / 16 / 0.0167 / (1.09^{-22}) / (1.0575^{22}) / 17.543 = 14.67534 \text{ years}$$

## Question 5

This question was poorly answered with most candidates applying the difference between the actual and expected salary increases to the total salaries instead of to total liabilities.

i) Analysis of salary increase assumption item as follows:

Age range	Number of members in the fund for the 3 year period	Previous total salaries (R)	Current total salaries (R)	Average liability at per member current valuation	Actual salary increase	Expected increase	Actual/Expected increase	Actual liab	Expect liab	estimated R impact
21 - 29	5 000	76 200 000	98 700 000	45 000	1.30	1.30	0.9933	225 000 000	226 508 588	-1 508 588
30 - 39	7 600	93 200 000	134 500 000	80 000	1.44	1.27	1.1377	608 000 000	534 417 809	73 582 191
40 +	9 000	110 800 000	135 600 000	138 000	1.22	1.22	1.0060	1 242 000 000	1 234 540 432	7 459 568
<b>Total</b>										<b>79 533 171</b>

Annual salary increases – 9.25%, 8.25% and 6.75% per age range respectively

- Valuation assumption close to actual for the ages 21 – 29 and 40 +
- Seems inappropriate for those in the age range 30 – 39 – actual increases higher than expected
- Large loss item here
- Age 40 + is the largest contributor to the liability – most important to get that right – does not seem inappropriate

ii)

Request the following information:

- Salary history of the 3 age ranges going further back than the 3 years to assess if the current experience is a once-off or if the salaries are fundamentally increasing in a way different to the assumption
- Employer's philosophy around salary increases for the different age ranges – what is the expectation for increases to be granted over the next 3 year period

## Question 6

This was a theory question and was poorly answered.

i)

Asset-based discount rate

- Implied market discount rate determined for each asset class
  - For fixed interest securities it may be GRY – for equities use current market price and expected dividend and or/sale proceeds
- Liabilities are valued using discount rate which is weighted average of the individual discount rates, based on proportions invested in each asset class
- Weights used could be based on actual portfolio or notional portfolio intended to match the liabilities
  - Could have 2 discount rates – one pre- and one post- retirement

Mark to Market (market consistent)

- Assets taken at market value

- Implicit assumption that a set of bonds can be found that replicates the expected cashflows from each type of benefit
- A yield curve is derived for each set of bonds
- Liabilities are discounted using the yield curve

#### Bond Yields plus risk premium

- Assets taken at market value
- For liabilities, the discount rates are based on bond yields as with mark to market, but then increased to take account of actual returns expected on other asset classes
- The increase in the discount rate is called the equity risk premium

ii)

#### The need for accuracy and prudence

- The purpose of the valuation
  - will help the actuary judge the degree of accuracy that is required
  - Will help assess whether best estimate assumptions are appropriate or whether it would be best to allow for the element of uncertainty about the future experience. This can be done by including an overstatement or understatement within the assumption.
- Funding method used
  - Consider the interaction between the funding method used and the assumptions
  - Different considerations based on size of scheme
  - Considerations for decrements based on benefit paid versus funded benefit
  - If a prudent funding method and prudent assumptions are used – may increase the likelihood of overfunding
- Timing of cash flows
  - Generally look at value resulting from overall combination of assumptions
  - Not appropriate to allow for uncertainty in one assumption by allowing for a margin in a different assumption
- Significance of errors
  - Be aware of the potential significance of errors in the assumptions – may help in the judgement
- Maturity of the scheme
  - Accuracy in setting assumptions may be more of an issue for a mature scheme with shorter durations, than a younger scheme where more flexibility allowed

## Question 7

*This question was reasonably well answered.*

- i)
- Group life cover has reduced underwriting requirements and a free cover limit, below which insurance is granted without the need for underwriting.
  - Defined contribution fund – may want the stability of a ‘known’ premium. Large variability in claims is not desirable in a dc fund. Insurance is more predictable in terms of timing and amount of premiums.

ii)

If more of the contribution into the fund goes towards death benefits, less is available for retirement benefits. The higher unit rate for insurance benefits will apply to all members, therefore the members’ who reach retirement age (or who take exit benefits from the fund), will have lower total benefits.

iii)

The fund can reduce the level of benefit from 3x salary to something lower – eg 2.5x. The underlying cost of insurance per R1000 sum assured will not be affected, but the cost of the insurance will be reduced, along with the benefit.