Faculty of Actuaries **Institute of Actuaries**

EXAMINATIONS

September 2000

Subject 304 — Pensions and Other Benefits

EXAMINERS' REPORT

Comment

Question 1

This was a straightforward bookwork question which was generally reasonably well answered by many candidates. The expression "owners of capital" caused some confusion, but is taken from straightforward core reading.

Question 2

This question was well answered causing little difficulty. Some candidates got bogged down in more detail than warranted by the mark.

Question 3

This question caused more difficulty as it required application of familiar themes to a different situation, nevertheless good candidates scored reasonably well.

In questions like this it is very important to read the question carefully and plan the answer. Candidates who scored less well tended to "plough in" and comment in detail on a narrow aspect of the situation.

Question 4

This question was generally poorly answered especially in part (ii) where candidates, as in question 3, did not discuss the issues either in enough breadth or depth.

Question 5

This question caused some difficulty to candidates as the question was presented in an unfamiliar setting. However these candidates who focussed on the question set and structured their answer as indicated by the question did reasonably well.

Question 6

Although this question was long, it was answered satisfactorily by well prepared candidates. There was some evidence of time pressure, however, as with questions 3 and 4, candidates who took time to read the question and structure their answer score well with an economical number of points.

1 (a) Beneficiaries. Any six sensible distinct (some of the following overlap) points including:

- benefit entitlements
- employee contribution obligations
- any additional expense charges
- risks involved
- treatment of entitlements in the event of corporate insolvency
- security of funded benefits
- degree of funding
- investment mismatching
- disputes procedures (e.g. contact at company or any industry-wide or state-sponsored body
- any right to opt out or requirement to opt in
- how beneficiaries of contingent benefits will be determined (e.g. specified by employee or left to trustee discretion)
- tax implications
- implications for State benefits
- asset choice
- investment policy
- benefit options
- discretionary benefits

(b) Owners of capital. Any six sensible distinct points including:

- description of the nature of the benefits being granted
- measure of the cost of
- benefit liability accrued (net of assigned assets)
- future (e.g. one year's) benefit accrual
- method used to determine the cost
- financial and demographic assumptions used in determining the cost

- how the cost would vary if previous year's assumptions were used (i.e. comparative information)
- how the cost would vary if various assumptions were varied (i.e. sensitivity analysis)
- degree of risk taken e.g. investment mismatching or options against company

2 (i) Items which would be analysed (i.e. actual v expected):

- expenses
- investment performance generally (e.g. of the scheme's matching assets)
- investment performance of the scheme's actual investments
- salaries
- pension increase in payment
- pension increases in deferment
- withdrawals
- new entrants
- early retirements
- ill health early retirements
- any transfers (bulk or individual)
- proportion of pension commutated for cash
- how the scheme's liability profile had changed

(ii) How to analyse mortality:

- group the data
- by age, sex and member class
- for age use age-bands which are credible …

… for instance, in-service members may have to be grouped together or even treated as not credible …

… while pensioners may still need to be grouped in fairly wide age bands, especially for older ages

- for each group compared the actual deaths with the expected number of deaths based on the exposed to risk
- consider calculating a confidence interval (e.g. if the analysis will be used to determine a mortality age rating or other type of adjustment) so that the potential error involved is clear
- comment on many unusual events e.g. flu epidemic

(iii) Could use it to help determine the mortality assumptions for the valuation.

However would need to consider how much credibility to give to the data.

May blend into population mortality (or other appropriate statistics, e.g. other similar schemes).

May need to modify in any event to allow for probable future improvements in mortality.

If analysis has been completed at each valuation then the trends in mortality can be analysed.

Can also use the analysis of mortality experience in the analysis of surplus for the 5-yearly valuation.

This would allow a comparison of actual mortality versus expected mortality ending the determination of the contribution to surplus/deficit from mortality over the intervaluation period.

- to decide whether to insure death benefits
- to decide whether to insure pensioner benefits
- to get/adjust factors e.g. commutation

3 (i) Suitability of wage inflation index-linked, mortality-linked bonds compared with CPI index-linked annuities. ("+" is an advantage of the bonds, "–" is a disadvantage.)

+ if the individual wants to maintain his/her standard of living then linking to wage inflation is more likely to do this than price inflation (depending on how the indices are constructed), & vice versa as a disadvantage if the individual only wants to meet the same cost of living

+ the bond is likely to be tradable which means that the individual can cash it in which will be nigh impossible with an annuity (because it is not a traded asset and mortality selection will prevent decent surrender values)

+ the stream of income is maintained after the policyholder's early death (which may be important e.g. if he/she supports a family or there is a liability which is being paid off)

+ there are probably lower costs associated with the bond compared with the annuity (e.g. at the very least the insurance company needs to allow for the cost of administration on the death of the policyholder)

+ bonds are more secure (unless the government underwrites the insurance industry)

– it is unlikely that the individual will live precisely the average life-span and therefore the income stream from the bonds does not match the individual's requirements for a personal income - this means that, to ensure a reasonable chance of sufficient income in later retirement, the individual needs to over-invest. This is another way of describing what is often called "mortality drag".

– the same applied in respect of contingent beneficiaries e.g. spouse

– the insurance company annuity can be designed to meet the individuals requirements e.g. with respect to dependants pensions or impaired lives

– competition may keep the price of annuities relatively low

(ii) Suitability for a scheme of wage inflation index-linked, mortality-linked bonds compared with

(a) CPI index-linked gilts ("+" is an advantage of the wage-linked bonds, "–" is a disadvantage)

+ they allow the scheme to match some of the mortality risk which cannot be eliminated - if population mortality improves as a whole then these assets will pay out for longer

– the link to wage inflation is less ideal than the price inflation which the liabilities are linked to, …
… but price inflation and wage inflation in a developed country are likely to be fairly strongly correlated and so this may be worth the risk to reduce the undiversifiable mortality risk

(b) equities ("+" is an advantage of the bonds, "–" is a disadvantage)

+ providing there is a material correlation between wage and price inflation, the bonds will match the liabilities much better than equities

+ the bonds will entail lower management costs (if they are purchased and held instead of traded)

+ in some countries, schemes are required to hold a certain proportion of assets in government debt

– in some countries (e.g. in the UK), if the scheme is in surplus then it is regarded as sensible to invest the surplus in equities

- if there is any likelihood of benefit improvements if the scheme is overfunded and there are trustees then equity investment may increase the chances of this

- the corporate management may prefer equity investment (e.g. because it helps reduce disclosed cost if this is based on "expected value")

+ maybe a greater risk of default for equities.

4 (i)

- establish how the existing state scheme is financed
- And whether it is funded or pay as you go
- If it is funded what the relevant member and employer contribution rates are
- And if it is unfunded whether there is an implied charge in taxes levied representing such contributions
- Establish whether it is possible to opt – out of the existing State Scheme
- And if so what the terms of opting out are
- And the basis adopted in setting them
- Establish whether the citizens of the country are typical of all members of the existing State Scheme (in terms of age, gender and earnings)
- If opting out is possible under the existing arrangement establish what proportion of employees do opt – out
- And at what ages, salary levels etc.
- Establish what private pensions vehicles are available in the country (may not be any since State Scheme generous)
- Establish the tax regime under which pension arrangements operate

- Establish the investment opportunities available to private pension investors
- And the long term expected returns from each of theses types of investment
- Comments can also be made on
  - retirement age
  - career breaks
  - dependents benefits
  - mortality statistics
  - marital statistics
  - historical salary growth/inflation/investment return

(ii)

- in general terms a basic objective would be that the value of the final salary pension foregone should be the same as the accumulated value of the contributions to the individual arrangement.
- In assessing these values, regard could be made of the probable type of investment that the private investor would hold.
- And a relatively high contribution scale would arise if it were assumed that all investments would be held in safe government backed bonds

- Although, ignoring the reinvestment and salary increase risks, it should be possible to reproduce the pension by holding such bonds
- Alternatively, if the country has a company stock market
- A lower contribution scale could be devised by assuming investment in such higher returning stocks
- Although there is greater uncertainty regarding whether the pension benefit will be reproduced
- If the basic objective of equivalence of value is followed, this implies an age and gender based contribution scale
- With higher contributions at older ages
- Which is more complicated to administer and difficult to explain
- Than an alternative flat rate scale
- Devised to give equivalence of value across the whole population
- Although the risk then arises that individuals will select against the State
- With a resultant cost to the State
- The question arises of whether it would be appropriate to enable accrued State pension rights to be transferred to the private sector
- which could result in the government having to borrow to raise the funds to make necessary payment
- particularly if the existing State Scheme is unfunded (or underfunded)

- The expenses involved in operating the private arrangement are likely to be greater than those incurred under the State Scheme
- and it would be possible to allow for this in setting the terms
- The contribution scale should reflect the precise benefits foregone (i.e. contingent spouses benefits, pension increases etc.)
- Although it would be possible to contract-out only part of these
- For example the single life pension might be the only element subject to contracting-out, with the State Scheme continuing to pay spouses pensions
- Which would offer some protection to the spouses (i.e. avoids member converting all pension rights to a single life pension at retirement)
- And would protect the State from selection by unmarried members

- If the contributions are going to be presented as a reduction in taxes, need to agree appropriate split between the member and employer
- In conducting the calculations to derive the scale, it would also be necessary to take account of any difference in the tax regime applying to the operation of State and private pensions

5 (i) For the next 10 years it is likely that contribution income will exceed benefit outgo.
The government could use the excess to build up a reserve fund
or they could use it to finance other expenditure.
After 10 years there is a need to ensure that income from contributions is at least equal to benefit outgo,
unless the government intend to supplement the scheme from other resources.

(ii)(a) Guarantees a minimum benefit for everyone who can afford to pay the contributions
No flexibility over contributions – problem for the poorer paid/those with less disposable income
Individuals may not survive long after retirement so a lump sum may be more valuable than a regular income
The money could be invested to provide an income in retirement
Or could be used, say, to buy a farm which would support the individual and their dependants
If individuals do have a long life, the lump sum may be used up before they die
Benefit is simple to calculate
Benefit is simple to pay

Contributions are simple to calculate

But records of the number of contributions will have to be kept
People are not likely to contribute unless the benefits appear to be worthwhile and achievable
>58's get a very high return for their contributions
The scheme may reduce the numbers falling back on state support
Over time inflation may erode the value of the benefit making it less attractive
Deflation may result in the contributions becoming onerous
It may be difficult to achieve a complete contribution record due to periods of unemployment or sickness
If the contributions can be paid at any age the income is likely to be variable and difficult to predict
Few people may survive to age 68 and there is no death benefit
The scheme is unfair if contributions continue beyond 30 years

(b) Allow a range of contributions or benefits

Allow contributions to be paid on behalf of others

Consider providing a pension at retirement instead of the lump sum
Or require a pension to be bought

Include provision in the scheme for the level of the benefits and contributions to be reviewed

Consider allowing a proportionate benefit payment in certain circumstances
Be prepared for there to be supplementary payments to the fund when necessary and transfer surplus money out as appropriate
Alternatively set up and maintain a working fund
Consider the addition of benefit payable on death to the spouse or dependants or making the scheme compulsory
Ensure that a maximum of 30 years contributions are payable

(iii) Need to look at the likely position when full benefits will be payable (in 10 years time and thereafter)
Does the social security ministry have any information on the likely take up of the scheme?
Do the contributions have to be made out of earned income?
Look at mortality tables appropriate to the sector of the population who will participate in the scheme.
Look at other countries
Consider trends in mortality
Look at employment statistics
Try to assess the ages at which contributions are likely to be paid.
Look at the age profile of the relevant population.
If the contributions can be made at any age, it will be necessary to consider the likely income and outgo over a number of years.
Investigate likely costs of administering the scheme

(iv) The size and age profile of the membership of the scheme should be examined.
It will take many years before accurate information on the likely take up for the mature scheme can be assessed.
The benefit payable during the first 30 years is generous and so take up by those over age 38 now is likely to be very high.
This may not be repeated once the scheme matures.
Information will be available regarding the take up at younger ages but, if the contributions can be made at any age, if younger individuals do not subscribe it will be difficult to assess if they intend never to join or if they are just waiting until they are aged 38.

Surveys of the eligible population should therefore be undertaken.
Trends in mortality need to be investigated.

The age profile of the relevant population should be monitored.
Birth, death and emigration trends will all be relevant.
Employment trends must be monitored

6 (i) Tax concessions can be given in full or in part under the following headings

- Employer pays contributions out of pre tax profit
- Employer contributions not taxed as employee remuneration
- Employee contributions out of pre tax income
- Investment income not taxed
- Investment capital growth not taxed
- Pension not subject to tax

Reduced contributions to the state retirement system
State subsidies e.g. partial matching of contributions, per capita payments
Guarantee to supplement investment returns if a pre-defined return is not achieved
Make the private provision of benefits compulsory.
Impose a maximum on the charges that can be imposed by investment / administration / product providers.
Make provision for a centralised contribution collection agency.
Make provision for a centralised administration system.
Make regulations simple.
Improve education/publicity
Reduce state benefits
Legislate to improve security of private pension arrangements

(ii) Impose restrictions on the size of funds which may be accumulated
Restrict the types of investments on which tax relief may be given
Limit tax concessions to benefits / contributions based a maximum level of income
Require

- Administration procedures to comply with minimum standards
- periodic valuation / reporting
- the arrangements to be supervised by someone independent from the employer / provider
- disclosure of information to (potential) beneficiaries
- benefits to be funded

assets to be kept separate from those of the employer
Professionals involved with the running of the scheme to report wrongdoing / non compliance

(iii) Individual entry age method
For each age calculate the present value of benefits to be accrued over future service
Allowing for salary increases,
investment income
and, if appropriate, expenses of running the scheme.
Divide by the present value of 1% of a member's salary

(iv)(a) Salary progression
Investment income
Mortality of members post retirement
Proportion married at death (after retirement)
Mortality of widow(er)s
Expenses
Mortality of members before retirement and probability of leaving the scheme would be ignored
as, otherwise, if the member stayed in the scheme till retirement the fund would be insufficient to provide full benefits.
Inflation

(b) Need to check what types of investment classes will be allowed
Need to compare the correlation of investment return with general salary growth.
May be able to get information about employee salary growth in the past but have to consider relevant for future.
If there has been no private pension provision in the past there are unlikely to be any sensible mortality statistics for scheme members
Population mortality may be available
but need to consider if the employee mortality is likely to be different
The statistics maybe out of date
Would want to consider more than one set of mortality statistics to see if there are any trends and to consider if they should be allowed for in the future
The timescale is very long so make allowance for changes in mortality would be sensible

Need to consider company's attitude to risk

(v) Contributions are paid over many years and accumulate
after deduction of expenses
at the rate of return earned by the fund.
The contributions paid will be a percentage of salary from time to time.
The desired benefit will depend on the level of salary at retirement.
The cost of providing that benefit will depend on
the investment return earned on the assets held
the rate of inflation after the member retires
the number of years the member survives in retirement
whether the member is married at date of death
how long the widow(er) survives thereafter
the expenses of operating the assets and paying the benefits
None of these factors can be known in advance
The rates calculated are based on assumptions which may, on average, approximate to the actual experience but which are unlikely to be exact for any member.
If the level of benefits is critical then, either contribution rates will have to be reviewed during the period up to retirement
or the scheme will have to operate a reserve fund of some kind.
If this is not acceptable then some members will retire on higher than desired benefits and some on lower.
In any case, the fund will only be able to guarantee benefits once they have commenced if a suitably funded arrangement is set up.
Targeting one benefit at retirement may under/over provide in other circumstances e.g. withdrawal, death, early retirement, late retirement
There could be legislative changes in future which could impact on the investment return/benefit level

(vi)

- This would be complex to administer
- Equities may be expected to give a real return with respect to earnings so they could be suitable for most of the working life
- 10 years is early to start switching
- Lifestyling is usually advocated as a strategy to protect members pension in the period up to retirement
- Which it will achieve to some extent
- Although it will not produce the biggest pension
- If equity returns are superior over this period
- Communication is key so that members understand what the strategy is trying to achieve
- And it might be appropriate to allow the member to select a lifestyling option

- Or to offer it as a default if no alternative selection is made
- The principle behind lifestyling fails if the member takes early or late retirement
- Although it may be possible to tie the switching period to an expected date of retirement (rather than normal retirement date)
- Although this will fail too if the member does not retire at this age
- And could be embarrassing to the employer if the member is refused early retirement upon application at the selected age
- Part of the retirement benefits may be available in cash form
- And the proposed strategy does not offer any protection to the amount of the cash benefit
- So it may be appropriate if the target fund at retirement includes a cash element which reflects the proportion likely to be taken in cash.

- Scheme has to decide how to invest the funds to provide the pensions promised
- Because of the guarantees, the scheme will probably need to invest in secure investments which will provide an income linked to price inflation unless the employer is prepared to supplement the fund to offset any shortfall
- There may be legislative constraints on the types of investments needed
- On the assumption that the scheme will invest in bonds the pension which can be provided will depend on bond prices
- Lifestyle investment can protect the member from the value of their assets falling relative to the rates charged by the fund for the pension over the last few years to retirement
- The duration of the bonds also needs to be considered
- And should be of the same expected mean term as the pension.