

Institute of Actuaries of India

Subject SA6 – Investment

May 2015 Examinations

INDICATIVE SOLUTIONS

Solution 1 :

i) Annuity rates will depend on the returns made on the investment in real estate prices. Therefore it's important to get the price and returns of the real estate.

It needs to be decided as to at what frequency would the real estate prices are required.

Valuation of property will be difficult:

Property prices are not readily available and can be subjective

Transactions occur at undisclosed prices, making difficult to obtain the price

Valuations can be expensive and is not undertaken regularly, this may be required as the annuity rate would be linked to increase in real estate prices.

The returns need to be adjusted by the expenses to be charged for annuity as there would be heavy expenses involved in managing the property portfolio. The cost of buying and selling are substantial with stamp duty for higher value transaction.

It will be difficult to recover the substantial up front charges in the product and if it is charged, the annuity rate would be uncompetitive.

Since the lot size requirement for buying any property is high it would be difficult to get exposure to the underlying assets as the annuity premium may be comparatively very small.

Availability of property linked bonds and REITs (Real Estate Investment Trusts) would help in making the right matching to the portfolio.

Any type of property linked derivative may be better suited for matching.

There would be few recognized residential property indices that could be available and used as a benchmark for the fund.

Further there are other factors that would influence the pricing consideration of the annuity:

The main challenge with the insurance companies is the inability to assess the liability on the annuity portfolio due to difficulty in forecasting the mortality. Mostly the country lacks the demographic data that are necessary to construct accurate mortality projection.

No model has been developed which can predict the improvements in life expectancy of the population accurately. Therefore there is risk of fall in mortality rates faster than that allowed in pricing or reserving.

There may be difficulty in differentiating the various segments of the population through the differentiated pricing since the regulatory restriction may not allow to distinguish the annuity rates on any other basis than gender, smoker status etc. [6]

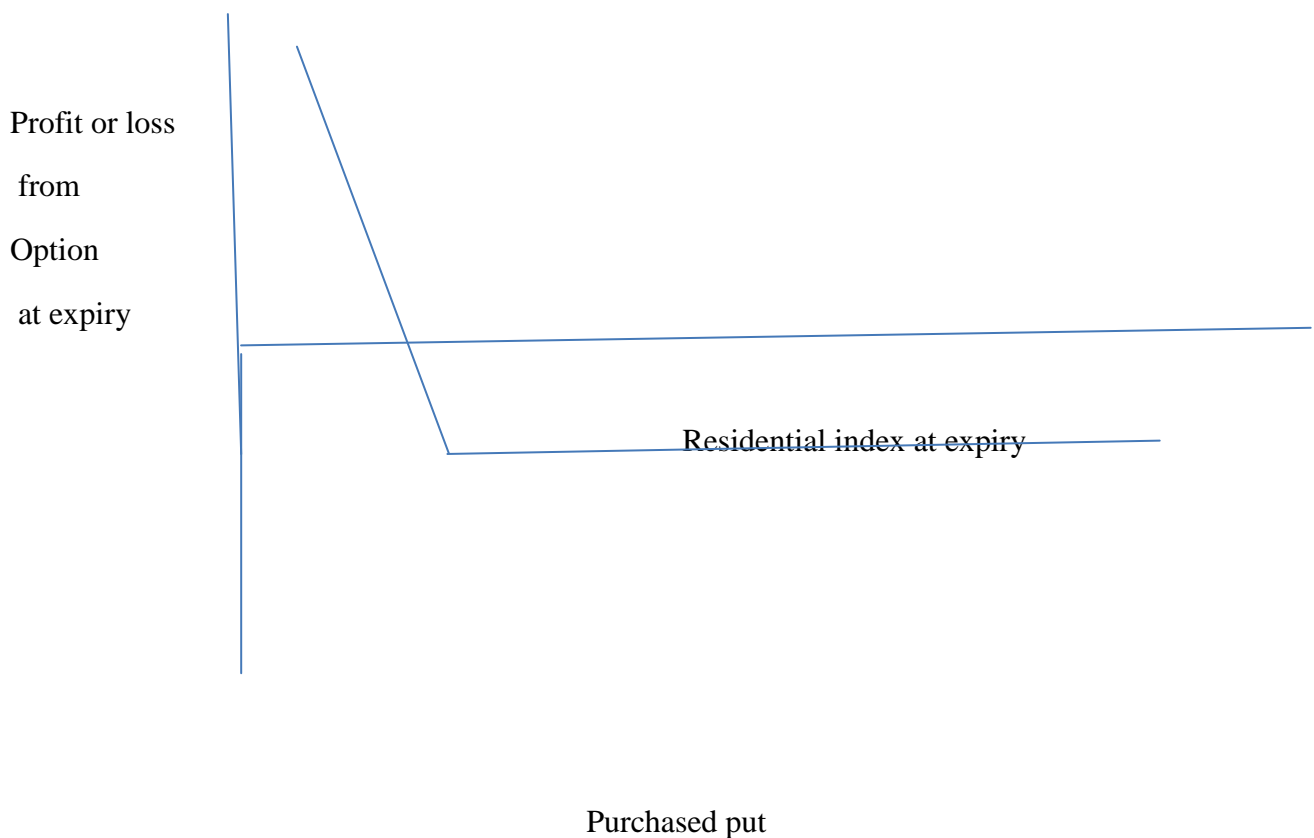
ii) An option could be set up to cover the guarantee that has been suggested. Put options could be purchased with strike price equal to 100% of the current index value. However since we are not capping the returns on Annuity the cost of option premium has to be borne by the fund.

These options have to be based on the index of residential properties which may be subjective and rarely published and perhaps unreliable.

In addition the property index is unlikely to match the actual portfolio, therefore substantial element of cross hedging risk would exist, and downside of the actual property portfolio might not be fully hedged by the options positions.

Such an option would be over the counter option, arranged with an investment bank and would be costly. Also finding an option for 10 years would be very costly and rare.

Due to small size of premiums being received it may not be possible to get into such frequent deals and may therefore be very costly for the fund.



[4]

iii) a) Traditional Non participating business:

There will be impact on liability of the portfolio especially for the guaranteed non par product with higher guarantees.

Hedging the returns and investment matching of the portfolio becomes very important. To the extent the portfolio has been hedged for interest rate fall there is less impact on the reserves.

There will be reduced profitability of the business as more capital is tied up for reserving and solvency requirements.

Likely impact on valuations like embedded and value of new business margin which may become lower due to expected lower yield.

Further saleability of such products may be impacted. The key issue would be match guarantees of the products while retaining the profitability.

b) Traditional participating business:

One off decrease in interest rate should not reduce bonuses as there may be margins built up from previous year's bonus declaration.

However there may be impact on the bonuses for new cohorts where the expected yield may have dropped.

It is important to project the bonus earning capacity of the portfolio to understand the impact on bonuses.

The lower interest rates are lower risk for participating products for there is an ability to reduce bonuses in case of the declining returns apart from the products where there may also be guarantees.

c) Unit linked portfolio:

Lower fund value for bond related funds, however there may be offsetting impact due to one off increase in market value of the existing portfolio. The new premiums will be invested at lower yielding bonds reducing the returns.

New business of unit linked may be impacted. However there may be increase in equity related funds. Here again there is need to check if the guarantees are offered in the products as they may become more onerous.

The profitability of the portfolio may reduce due to the lower charges collected on the interest rate linked funds but may offset generally by more than expected recovery from equity related funds.

d) Annuity portfolio:

Lower interest may force investment of Single premium from the annuity new business or the maturing fund (in case of annuity being offered from Pensions proceeds) into lower yielding bonds. In case there is guaranteed annuity rates provided in long term there would be funding requirements to provide annuity at higher rates. A hedged portfolio for vested funds getting annuitized may be less impacted by declining interest rates.

The annuity product may need repricing in declining interest rates scenario.

For existing single premium standalone annuity the impact may not be as severe as the reinvestment risk would be lower. However as the annuity contracts are very long term in nature, there would be reinvestment risk for proceeds received from maturing assets in long term.

[6]

(iv) a)

The asset mix for different lined of Life Insurance Company vary and are dominated by policyholder expectations and risk appetite.

Traditional with profits policyholder accept higher amount of risk and uncertainty in expectation that they will receive higher return in the long term.

Many of the benefits still would be matched by the bonds; however there would be scope to hold other riskier asset categories in the hope to earning higher long term return.

The ability of making investments in risk assets depends on Life Company's bonus philosophy and solvency position as well as investor's expectation.

The major risk in this portfolio is to generate investment returns well over 5% to support the regular bonuses. Due to long term nature of the product, the duration of the product would be very high and any reduction in yield of the portfolio will significantly change the bonus payouts.

At 5% and below the product would act like a non-participating product with very long duration and high guarantees. Hence although this is a participating product the guarantees embedded in the product is high.

It is therefore important to keep the assets duration very long and lock returns for the maximum duration possible.

The duration matching of existing portfolio becomes important and in case of declining interest rate there may be need to stop or reduce new business of the product.

A good asset mix might be:

G Sec	20-30 year	50%
G Sec	5-15 years	Upto 10%
Infrastructure bonds	25-30 years	Upto 25%
Corporate Bonds	20 years or more	Upto 20%
Money Market		Upto 10%
Equity		Upto 10%
Alternate Asset class		Upto 5%
Cash		Upto 2%

Or any suitable asset mix which has long dated safer bonds.

[4]

b)

For entering into swaps a considerable notional amount is required else the swap contracts will be very expensive to enter. Hence there is need to estimate the future cash flows from the product including new business if existing business is not sufficient. As these projections are heavily dependent on the set of assumptions holding true the life insurance may find itself over / under hedged at a later date.

The other risks associate with the swaps would be

Basis Risk – cash flows received may not match actual liabilities requirements (this could be function of interest rate/inflation or longevity risk for people taking money back changing the nature and tenor of the liability cash flows compared to the modelled projections.

Investment Risk: Requirement of collateral can force the fund into pre-maturing some assets.

Credit risk is due to uncertainty in counterparty's ability to meet its obligations.

Collateral risk: the assets posted may decline in value more than compensated for by the initial haircut, leading to further margin fall.

If 'in money' then the loss on actual investment when bank defaults.

The fund may be subject to the cost involved in the transaction and may find it difficult to justify the investment to its policyholder.

Since the participating policyholder may want excess returns to be generated by the fund, they may find that the guarantee offered in this product is adversely affecting the investment freedom of the fund. The returns to other products also may suffer if this product witnesses some heavy loss. [5]

v)

The fund manager has to track the performance of the index, so replicating the index is not essential.

Investing in each and every stock and so having small holdings in each stock will result into high dealing costs (necessary each time the relative sector weightings change).

This would reduce the performance of the fund and so cause underperformance relative to the index.

Research has shown that, after overall market movements have been taken into consideration, the share price movements of the companies within industrial groupings tend to correlate more closely with each other than with companies in other industries, so holding a subset may well replicate the performance of the sector.

The share price movements reflect the changes that have occurred in the operating environment and such changes affect companies in the same industries in same manner.

Stratified sampling of the performance of each sector may have shown that the performance of the chosen stocks is a very accurate measure of the performance of the sector as a whole.

Sampling may enable the fund to choose its timing in addressing whether or when to replicate changes to the underlying index. [3]

vi) a)

CNX Nifty is the appropriate benchmark because:

- The CNX Nifty is the flagship index on the National Stock Exchange of India Ltd. (NSE).
- The Index tracks the behaviour of a portfolio of blue chip companies, the largest and most liquid Indian securities.
- It includes 50 of the approximately 1600 companies listed on the NSE, captures approximately 65% of its float-adjusted market capitalization.
- The CNX Nifty covers 21 sectors of the Indian economy and offers investment managers exposure to the Indian market in one efficient portfolio.

- High liquidity
- Historical data easily available
- Hedging effectiveness because derivatives are based on it
- The CNX Nifty is derived from economic research and is created for those interested in investing and trading in Indian equities.
- The CNX Nifty is a diversified index, accurately reflecting the overall market.
- The reward-to-risk ratio of CNX Nifty is higher than other leading indices, offering similar returns but at lesser risk.
- Market impact cost is the best measure of the liquidity of a stock. It accurately reflects the costs faced when actually trading an index. For a stock to qualify for inclusion in the CNX Nifty, it has to reliably have market impact cost below 0.50 %, when doing CNX Nifty trades of Rs 2 crores.
- Governance - Nifty is managed by a professional team at IISL. [3]

b)

Advantages of active fund

- The opportunity for outperformance can give an edge in retaining the customers and getting new customers
- Diversification from the current funds offered by the company
-
- Active style more successful in an emerging market like India which is not efficient.

Challenges

- Managing costs - Higher fees, higher operating expenses but the cost cannot be passed on to the customer due to FMC cap by IRDA
- Maintaining consistency over 2-year - It is not easy to pick winners consistently, year after year.
- Higher potential for loss than passive funds
- Need to use risk-adjusted performance measures. [4]

c)

Stock selection approach

- We may use growth-style stock selection strategies or value based approach to reach our target return.
- For growth style, look for the stocks of companies that offer strong earnings growth potential. While earnings of some companies may be depressed during periods of slower economic growth, growth companies generally seek to achieve high earnings growth regardless of economic conditions. "Emerging" growth companies are those that may have the potential to achieve high earnings growth, but have not established a history of strong earnings growth.
- Growth stocks usually have high price-to-earnings and price-to-book ratios, which means that these stocks are relatively high-priced in comparison with the companies' net asset values. But because of their growth story they keep outperforming the market.
- Look for high-quality, successful companies that have posted strong performance and have expectations to likely continue to do well.

- Even a value based stock selection may work if we are able to research and find out good quality stocks at low prices and invest early into them. These stocks may have a high book value and regular income / cashflows but may be undervalued by the market for some reason.
- The research may be top down (economy, Industry and then Individual stocks etc) or bottom up but finally the research quality has to be good and stocks identified through such approaches, whether a growth style or value based style approach, need to be continuously evaluated for its performance. [2]

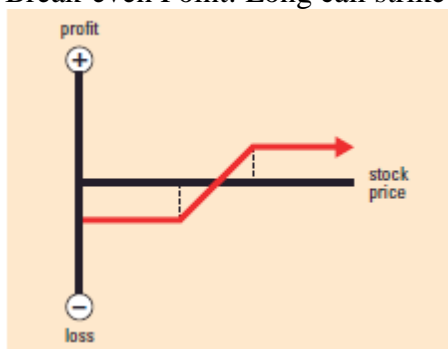
d)

A typical investment mandate could contain

- Objective in terms of benchmark, surplus, etc.
- Regulatory constraints – restricted asset classes, use of derivatives for speculation
- General constraints – company’s attitude towards risk, cost efficiency
- Counterparty restrictions
- Performance measurement criteria
- Governance structure and delegation
- Reporting [3]

vii)

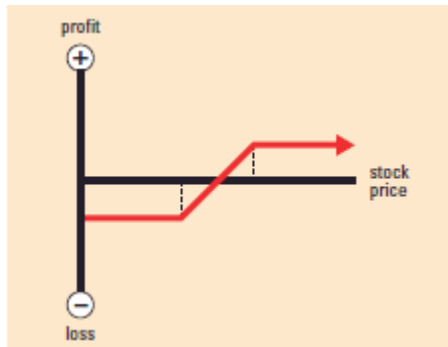
- a) Bull Call Spread - Buy 1 call; sell 1 call at higher strike
 Market Outlook: Moderately Bullish
 Risk: Limited
 Reward: Limited
 Break-even Point: Long call strike plus net premium paid



[3]

b)

- Bull Put Spread - Sell 1 put; buy 1 put at lower strike with same expiry
 Market Outlook: Neutral to bullish
 Risk: Limited
 Reward: Limited
 Break-even Point: Short put strike minus credit received



[3]

viii)

- (a) This contradicts the inequality $p \leq X$. So use the arbitrage opportunity in the proof: sell the option and wait. If the option is exercised, buy the stock for Rs 300 and pocket Rs 100 plus the stock; if the option is not exercised pocket Rs 400 from the original sale of the option. [1]
- (b) This contradicts the inequality $c \leq S_0$. Sell the call option, buy the stock, pocket Rs 20 and wait. If the option is exercised, deliver your stock, otherwise keep it. [1]
- (c) Here $S_0 - Xe^{rT} = 300 - 200e^{-0.025} = 1.05$. So the inequality $c > S_0 - Xe^{rT}$ is violated: the option price should be at least Rs 105. Short sell share for Rs 300, buy call option for Rs 50, deposit Rs 250 for 6 months. After 6 months collect $250e^{0.05/2} \approx 256$, use option to buy share for Rs 200, and use it to close the short position on the share, pocket Rs $256 - 200 > 0$. [2]
- (d) Here $Xe^{-rT} - S_0 = 2e^{-0.025} - 1 = 0.95$, so the inequality $p > Xe^{-rT} - S_0$ is violated (just): the option price should be at least Rs 95. To find the arbitrage strategy, invest in Portfolio C, costing Rs 190, and borrow Xe^{-rT} , i.e. Rs 195, for six months (i.e. short sell portfolio D). The balance of the loan will be Rs 200, and portfolio C will be worth at least this much, so we make at least Rs 5. [2]

ix) a)

The purpose include:

Hedging for the existing portfolio

Reinvestments of the maturity proceeds of the existing fixed income investments

Investment of interest income receivable

Expected policy premium income receivable on the Insurance Contracts which are already underwritten in Life and Pension & Annuity business in case of Life Insurers and General Insurance business in case of General Insurers

The overriding principle is that any use of derivatives should be to use for hedging purposed only to reduce interest rate risk in the Company. [2]

b)

The notional amount to be derived as credit equivalent amount using the current exposure method (mention the section as per regulation section (D))

Subject to the notional principal amount equivalent to 100% of the book value of the fixed income investments under the Policyholders Fund (excluding ULIP Funds in case of Life Insurers) and shareholder funds.

An example would be to conduct the 100bps sensitivity of interest rates to the value of assets and liabilities and use the shortfall if any on the scenario as the notional amount.

[3]

c)

Solutions: The statutory reserves are calculated on prudent assumptions after applying some margin on the parameters. Further the liabilities also have margins for adverse deviation. Thus if the company maintains assets to match the statutory liabilities then an ALM exercise based on realistic projection of assets and liabilities will have higher assets than the realistic liabilities and may not require further assets to match the liabilities even if the interest rates change by 1%.

While conducting the ALM exercise the CIO must have adopted similar approach of testing assets and liability at each future point. However there could be difference due to following:

Using higher persistency than used to derive the valuation basis could lead to shortfall of assets in future.

Using higher mortality than used in valuation can also lead to higher assets requirements in future.

Interest rate assumed by CIO may be more volatile than assumed in valuation as valuation interest is a long term assumption and is further distorted by MAD.

Investment of maturity proceeds from assets may be taken at lower yield (as interest rates are dipping) and therefore there could be a need to hedge the liabilities. This will be particularly important if the liability is long tailed.

[3]

d)

The assets should be chosen to match the nature, term and currency of the liability.

Since the company also sells all lines of business and especially traditional products, some excess returns could be generated by choosing an appropriate structured product.

Another benefit of the structured product is that it will allow company to get exposure in the underlying securities which otherwise may be difficult to get given its price or lot size.

Structured product may also allow company to diversify its assets portfolio, an e.g. of it could be having structured product based on property which otherwise would be administratively difficult to obtain.

The fit of structured product in the life insurance company's portfolio would also depend upon:

Return expected – what is going to contribute to the overall returns

Taxation – are there any implications for the returns or other aspects of the portfolio

Applicable regulatory valuation rules – what rules may apply and will they cause complications

Accounting treatment of product – is it treated as capital or are there income aspects that need to be allowed for

Integration with existing portfolio- does it make strategic sense

Its effect on risk – how does it impact the overall portfolio position [4]

x)

Investment Strategy :

The aim of investment strategy in a life company is to be able to meet its future liability and the cash flow needs while able to generate smooth and better returns for the policyholders and shareholders.

In case of assets being valued at lower of book or market value the valuation of assets may significantly drop vis a vis the value of liabilities in the scenarios where yields are rising as the value of liabilities will largely remain unchanged because the liabilities are largely guaranteed and valuation rate is not changed easily.

This may force life companies to hold excess assets or interest rate insensitive assets depending on the view on yields.

This may restrain the investment choices of the company. Investing in interest insensitive assets may effectively mean investing in short dated bonds or money market. This may lead of duration risk of assets vis a vis liability. The returns from investments also will be impacted.

Due to volatile nature of valuation there be need to monitor the investment more closely there by increasing the administrative expenses.

Solvency Ratio:

The solvency ratio is derived as excess assets over liabilities over the required solvency margin.

The assets if valued at lower of book or market value will be volatile as yield on assets move in market. Thereby the solvency ratio will also be very volatile.

This may require company to call capital instantaneously to meet the regulatory solvency requirement. This capital may be then tied up with business even at times when solvency ratio is stable and higher.

Hence the capital requirements due to this change would be volatile and more capital will have to be set aside for solvency requirements.

Reserves held against non-par products:

The reserving is based on the long term assumption of yields which can be earned on the portfolio. The change in method of valuation of assets does not change the yield earned on

the asset, however it would change the way the investment gains are calculated for accounting purposes.

Since the liabilities are determined on book basis and assets on the lower of market or book value there would be a higher possibility of mismatch between Assets and Liabilities in the balance sheet specially if interest rates are increasing. To account for higher volatility in the balance sheet the reserves may be more prudent having higher margin for adverse deviations. The higher level of prudence would imply a higher amount of capital being locked as reserves.

Asset Shares for participating portfolio:

The asset shares for participating portfolio should be calculated using either market related yield or book yield earned on the portfolio but not a hybrid approach whereby the lower of the two will not be appropriate.

The assets are held for long term hence a book value yield may be better to use for calculation of asset shares. Also to have a stable approach towards bonus declaration a book value approach is more preferable. Some companies use the market value / market yields approach. However in such cases, if there is a significant exposure to equities then the returns on market value basis may vary significantly year after year causing a higher fluctuation in the value of the asset shares. The bonus declaration in such cases needs to follow some other alternative approach and may not be fully aligned to such volatile returns.

To try and align the asset share calculation to the lower of book value or market value will create a lot of confusion and ambiguity.

The surrender scales, maturity benefit paid with respect to the asset shares may or may not be volatile but it will be difficult for policyholder to understand the credited yield as the common and acceptable method of valuation is either purely book basis or market basis. A hybrid approach will make the growth of asset shares quite difficult to predict.

[6]

[70 Marks]

Solution 2 :

i)

Responsibilities of a plan actuary for the DB scheme

- to know the generally accepted pension valuation and funding methods,
- to know which methods are applicable to the plan under consideration,
- to establish appropriate assumptions for valuation,
- to estimate the effect of plan size on the stability of its funding,
- to value benefits other than retirement benefits, if granted (e.g., disability benefits);
- to model future cash flows of the plan,
- to value plan assets appropriately and
- to model sensitivity of the plan to changing economic environment

[3]

ii)

ALM is more important in pension sector as compared to life sector

- People put in their savings in the Pension funds whereas Life Insurance is about protection though in some products the savings component is clubbed with protection.

In India the savings products are the ones, which are majorly sold. Thus ALM becomes equally important in many cases even in Life. But as mentioned above the Pension is all about managing the retirement savings.

- The revenue of pension fund is a significant portion for a household. People after retirement need regular money to be able to buy health protection. There is usually no recourse if the pension amount becomes insufficient.
- There is a big gap in the asset and liability duration which makes pensions a perfect candidate for ALM.
- Pension funds have to manage very different profiles like long duration, uncertainty of life expectancy, heterogeneity of contribution between members, in certain cases differences of behaviour at the age of retirement (100% life annuities against 70% annuities/30% lump sum), possible reversion to the widow, etc. Also, mathematical reserves, contributions and benefits aren't as predictable like with simple endowment or money bank products.
- Generally, the trustees bear the downside risk of under-funding but gain little if there are higher returns. ALM strategy helps limit the downside risk but may have a counter impact on returns. [2]

iii)

Problems with “asset-centric” approach

- Changing financial circumstances and/or appetite for risk whereas the strategic asset allocation is less dynamic and usually set at the start. Also, changes to strategic asset allocation often requires approval from the Board and senior management, making the process less appealing.
- Disconnect between liability-related risk and “risk” as defined by the investment manager: From the insurer’s perspective, the most important risk in a DB scheme is solvency (or an unhealthy funding ratio). Whereas for the investment manager, “risk” is the extent to which his portfolio acts differently to the specified benchmark portfolio for a particular asset class.
- Narrow focus and disconnect between managers of different asset classes.

Changes in market benchmarks: As time goes by, the composition of market benchmarks can change quite substantially causing unnecessary changes to the portfolio

The liability driven investment strategies focus on the nature, term and currency of the liabilities and hedging the same is given prime importance. Fund manager for different types of liabilities needs to adopt a different approach. [4]

iv)

A balanced approach towards Equity and Debt will help. The asset allocation should be determined after considering the liability profile of the retirement scheme. This would include understanding the following:

- a. The current age of employees and the retirement ages are important. A useful information would be to know the number of the people who have already retired and are receiving the pension as compared to the people who are currently working and generating the revenues. The higher the number of pensioners (ex-employees) as compared to current employees the investment profile needs to be conservative having more debt since a high percentage of the liability is fixed and immediate. Whereas in case the population which has retired is small and a large part of the

population is very young then the liability will take a few years wherein large cash flows would begin hence the investments can have a higher share of equity.

- b. Similarly the information on the number of the employees who have completed 20 years of the service or are close to completing the same vis-à-vis the number of employees who still have a long way to finish 20 years will be helpful. Again, if a higher percentage of people have completed 20 years or are close to it then the liability becomes high & immediate and thus the investment strategy need to be more conservative having more debt in the portfolio.
- c. How strong is the company's solvency position and profitability. A company with strong net worth and high profitability can give more confidence to the trust in taking more investments risks and have higher equity component.
- d. How well funded is the scheme (the plan surplus), will be an important consideration. If it is well funded on conservative assumptions then the proportion of Equity can be increased.
- e. The employee turnover due to exist and the wage inflation, i.e. the past increases in salary in the company will be important to know.
- f. The past statistics on death and ill-health related exits will also be useful information. This helps in determining the likely cash outflows.
- g. Risk appetite of the management and immediate liquidity requirements if any will be very useful in determining the asset allocation. Higher risk appetite allows more Equity proportion in the portfolio. [5]

v)

Matching of cashflows

- Under this approach, a fixed income portfolio of high quality bonds is established with cash flows that exactly match the expected cash flow requirements of the pension plan's liabilities. This approach minimizes or eliminates the impact of interest rate changes to the extent that cash flows actually happen as expected.
- There is still the risk of future cash flow mismatches which can be caused by either the pension plan cash flows occurring differently from the projected cash flows due to mortality experience, or by a default of one or more of the bonds that have been purchased.
- There are different degrees of cash flow matching. Two distinguishing characteristics are the size of the cash flow buckets (weekly, monthly, annually, etc.) and the degree to which the time value (usually expressed as present value) is reflected. Cash flows (including interest and principal prepayment) that appear to be matched when aggregated on an annual basis may be grossly mismatched from month to month and could imply a significant borrowing requirement and/or portfolio rebalancing requirement.
- In addition, cash flow matching methods usually ignore the time value of money.
- Because fixed income securities must be purchased which exactly match the benefit payment stream, cash flow matching can be a costly process since certain cash flows may not be available in the exact amounts. It is an inflexible approach and sometimes

may not be achievable. This is particularly true if the cash flow match extends for a prolonged period.

- Derivative securities such as Swaps can now be used to structure the portfolio more efficiently. Care must be taken to ensure that these Swaps are appropriately priced and that the counterparty is financially sound.

Duration match

- This is a “price-sensitive” method unlike cash flow matching since it reflects the time value of money or the price sensitivity of the cash flows in each segment.
- Under this approach, a fixed income portfolio is constructed using traditional, modified, or effective duration, convexity or higher order derivatives used in conjunction with nonparallel duration analysis. The intent is to construct an asset portfolio that will move in tandem with any changes in the value of the liabilities as a result of changes in interest rate levels.
- This approach is more flexible, and hence, less expensive than the approach adopted under cash flow matching, and is more appropriate for longer term liabilities.
- However, certain changes in interest rate levels such as nonparallel yield curve shifts will result in a mismatch of the assets and liabilities, particularly if traditional duration measures are used in immunizing the portfolio.
- A close monitoring and frequent rebalancing may be required to ensure that any mismatch is minimized.
- An initially well-matched position can become more and more mismatched with the passage of time, even if no assets are bought or sold and no new liabilities are introduced. This is often referred to as “duration drift” (i.e., the duration of the assets and liabilities changes at different rates with the passage of time).

Combination of cash flow match in earlier years and duration match in subsequent years

- Under this approach, a portfolio of fixed income investments is constructed to match the pension cash flows for an initial period, and the remaining portfolio is then structured such that its modified duration and perhaps other characteristics match that of the longer term liabilities.
- Since cash flow needs are fully covered for a number of years, the risk to the plan due to small changes in interest rates is reduced.
- This type of approach usually involves continually rolling the cash flow matched portion forward so that the duration matched component is on a declining liability stream. This approach still involves some mismatch risk, and hence, rebalancing may be required on a regular basis.
- Although some changes in the yield curve can be accommodated by providing an additional margin of assets over liabilities and permitting the investment manager to adjust the assets on a fairly regular basis, it is difficult to ensure that the plan’s surplus is not being compromised.
- Active trading in the portfolio will likely take place on a regular basis.
- If the investment manager uses callable bonds, mortgage-backed securities and other mortgage commitments in their immunized portfolios, these vehicles also can have embedded options, and simple duration is not a useful measure for them. Investment managers should, therefore, use a calculation that utilizes effective or option-adjusted duration to ensure that an accurate measure is taken of all the embedded options.

[6]

vi)

Risks when choosing an immunization approach

- Credit risk refers to the possible insolvency of an insurance company underwriting an annuity contract, or the insolvency of the issuer of a bond, etc.
- Interest rate risk - potential economic losses which arise from the disinvestment or reinvestment of cash flows or changes in the level and term structure of interest rates.
- Growth risk – if the liabilities are linked to inflation and wage levels, traditional immunization techniques using nominal fixed income securities do not ensure an adequate hedge.
- Liquidity Risk - the inability to liquidate securities in a timely manner, or where liquidation value is less than market value. This risk is typically not considered to be an issue with respect to an ongoing pension plan, since the plan may continue to have contributions and liquid investments including cash that can be used in lieu of liquidating securities at a loss.
- Longevity risk – esp for smaller schemes where law of large numbers may not be applicable. This can also have an aggregating effect on other risks like liquidity, interest rate, etc.
- Spread risk between government and corporate bonds
- Terminations of active employees are difficult to predict from year to year and can have a material impact on cash flow requirements.
- Value of embedded options and guarantees may be difficult to estimate and hedge.

[4]

vii)

The plan's funding status is a key factor in determining an appropriate hedge ratio.

Sponsors whose plans are in surplus have the flexibility to target a higher hedge percentage (80% to 100%) and they may choose to do so since the risk to the surplus from declining interest rates is higher for them than the benefit due to the potential surplus enhancement from rising rates. However depending on how the sponsors view it, the surplus plans may also serve to provide the strength to take more risks and mismatch the assets and liabilities to generate more returns.

Sponsors whose plans are in deficit may pursue a lower hedge ratio, and focus more on other options, such as asset growth to supplement contributions, in order to close the funding gap. These same sponsors may aim to increase the hedge ratio as funding status improves. However in many cases such plans may not like to risk it further and may like to go for more hedging since their ability to take more risks to generate better returns is lower. Thus it depends on the sponsors risk appetite and the manner in which they view the situation.

[2]

viii)

- a) The QSD = (12.0% - 10.5%) minus (MIBOR + 1% - MIBOR) = 0.5%.

[1]

b)

Alpha needs to issue fixed-rate debt at 10.5% and Beta needs to issue floating rate-debt at MIBOR + 1%. Alpha needs to pay MIBOR to Beta. Beta needs to pay 10.75% to Alpha. If this is done, Alpha's floating-rate all-in-cost is: $10.5\% + \text{MIBOR} - 10.75\% = \text{LIBOR} - 0.25\%$, a 0.25% savings over issuing floating-rate debt on its own. Beta's fixed-rate all-in-cost is: $\text{MIBOR} + 1\% + 10.75\% - \text{MIBOR} = 11.75\%$, a 0.25% savings over issuing fixed-rate debt.

[3]

[30 Marks]
