

INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

20th October 2009

Subject SA6 – Investment

Time allowed: Three hours (9.45* - 13.00 Hours)

Total Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. *Please read the instructions on the front page of answer booklet and instructions to examinees sent along with hall ticket carefully and follow without exception*
2. ** You have 15 minutes at the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*
3. *You must not start writing your answers in the answer sheet until instructed to do so by the supervisor*
4. *The answers are expected to be India Specific application for the syllabus and corresponding core reading. However, substantially the core reading material is still taken from material supplied by Actuarial Education Company which are meant for UK Fellowship examination. The core reading also contains some material which is India Specific, mostly the IRDA regulation. In view of this, it should be noted that focal point of answers is expected to be India Specific application. However if application specific to any other country is quoted in the answer the same should answer the question with reference to Indian environment.*
5. *Attempt all questions, beginning your answer to each question on a separate sheet.*
6. *Mark allocations are shown in brackets.*

AT THE END OF THE EXAMINATION

Please return your answer book and this question paper to the supervisor separately.

Q 1) A Public Sector Undertaking (PSU) bank in India offers a DB pension plan to their employees. The pension assets are self managed. The PSU bank has hired an Investment Actuary to suggest the main risks in managing pension fund assets and to assess the risk tolerance of the pension plan assets. The Investment Actuary, after assessing the Asset-Liability profile of the plan, has noted down the following six specific features of the plan:

- ? The pension plan is in surplus. A pension actuary who did the valuation of the liabilities had stated a lower liability for the pension plan. Hence, the fair market value of the pension plan assets is higher than the liability [Present Value of the Obligations].
- ? The average age of the current workforce is 40 years and the normal retirement age is 60 years. The ratio of the active work force to the pensioners is 4:1.
- ? The bank has generated a large profit in the current year and its operating and financial leverage ratios are low.
- ? The bank has a large Mutual Fund subsidiary.
- ? The bank offers early retirement benefits for early retirement on ill-health grounds.
- ? The Income Tax Rules allow the pensioners to commute up to one-third of the value of the benefits payment and take it as a lump sum payment at retirement.

A) Describe the general liability features of a Defined Benefit Pension Plan in terms of the nature, term (time horizon), liquidity requirements and investment freedom. (12)

B) What would be the main objectives of the investment policy for this DB Pension Plan? (3)

C) Explain how each of the features listed above by the Investment Actuary would increase (or decrease) the risk tolerance of the pension plan assets. (12)

The following financial statistics have been made available by the above bank:

- ? The annual salary cost is Rs 900 crores
- ? The PSU bank has mobilized new deposits of Rs 18000 crores in the previous year.
- ? The bank also generated a profit of Rs 600 crores over the same period and the profit has been growing at a compounded rate of 12% per annum.
- ? Duration of the liability under the Pension Plan is 22 years.
- ? The discount rate applied for calculating the Present Value of the Obligations [liability under the Pension Plan] is 7% pa.
- ? The Pension Plan Assets has achieved a compounded annual rate of return of 9.25% over the last five years.
- ? The current asset allocation for the pension plan assets is as follows :

(i) Equities	50%,
(ii) Government securities with remaining term less than 5 years	20%
(iii) Government securities with remaining term more than 5 years	20%
(iv) Money market instruments	10%
(v) Total	100%
- ? The long term expected rate of return on the Pension Plan Assets is 8% per annum.

D) Based on the information given above, redraft the investment objectives for the pension plan (2)

E) You are required to classify the risk tolerance level of the pension plan assets under one of the following categories: (i) Low (ii) Average and (iii) Above Average.

Based on the information provided above, recommend an appropriate classification and briefly explain the rationale underlying your recommendation. (1+2=3)

The following table provides more details on the current asset allocation pattern:

	Asset Category	Expected Return per annum	Existing Allocation	Suggestions (Increase / Decrease/ Unchanged)	Explanation as to why it is to be increased decreased or kept same.
1	Equities (Index stocks)	12%	45%		
2	Equities (Mid-Caps)	14%	5%		
3	G-Secs <=5 yrs	7%	20%		
4	Long term G-Secs	8%	20%		
5	Money Market	5%	10%		

F) Complete the above table specifying your suggestion against each asset category as to whether the allocation must be increased/decreased or kept unchanged. Briefly explain the rationale underlying your suggestion in the last column of the table. (10)

Note: Assume that your suggestions will not breach any investment restrictions on the minimum/ maximum amount that can be invested in each of the above asset categories.

The IRDA norms require the portfolio returns to be computed through Modified Dietz method which is a TWRR (Time Weighted Rate of Return) methodology. This methodology uses a daily weighted adjustment of cash flows that occur during a measurement period (more specifically it weights each cash flow by the actual amount of time it is held or absent from the portfolio). The method calculates the TWRR using the formula given below:

Return (Modified Dietz) =

$$(\text{Ending MV} - \text{Beginning MV} - \text{CF}) / (\text{Beginning MV} + \sum \text{CF}_i * W_i)$$

Where MV =market value, CF = cash flow

W_i = weight of the cash flows based on proportion of the total number of days in the period that cash flow has been held in (or out of) the portfolio.

You are given the following information:

The Market value of pension plan assets of the PSU bank as on 31st March 2008 was Rs.500 crores.

End of the Month	Market Value (in crores of Rupees) just before the cash flows if any	Cash Flows
April 08	512	
July 08	515	78
September 08	592	
November 08	600	96
December 08	705	
February 09	710	
March 09	725	

G) Calculate the TWRR for the portfolio using the Modified Dietz Method (3)

The bank wants to understand the volatility in the portfolio of pension assets and thus estimate the amount of extra contribution which may be required to ensure that the pension plan is not underfunded. This risk of underfunding is more apparent in the last month of the financial year i.e. March since any underfunding due to erosion in the value of assets would be reflected in the financials after the accounts of the year are prepared. Thus by the end of February 2009 the bank wants an estimate of the Value at Risk i.e. the analytical VAR (which assumes normal distribution) so that it would know what is the additional funding that would be required on account of asset volatility. Assume that the expected return on the Pension Plan Assets is 9% pa and the standard deviation of the returns is 18% pa. The asset value at the end of the month of February 2009 is Rs.710 crores.

H) Calculate the monthly VAR for the pension plan portfolio at 95% confidence level. State assumptions, if any (3)

The bank is contemplating to introduce a DC (Defined Contribution) Pension Plan in lieu of the current DB Pension Plan for all employees joining the bank on or after April 01, 2010.

I) From an Asset Liability Management [ALM] perspective, compare and contrast a DB pension plan viz-a-viz a DC pension plan (5)

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Q2) You are a senior actuary working within the actuarial/risk department of an investment bank providing customized investment solutions for institutional investors and High Net Worth individual investors.

You are aware of a number of domestic investors who would wish to have more direct investment exposure to the Indian life insurance market.

You have a client company which is a large financial conglomerate with a life insurance subsidiary. This client company often approaches you with ad hoc assignments related to the insurance company. Whilst solvent, the parent [client] company wishes to manage its working capital more efficiently and avoid unexpected

liquidity stresses caused by requests for capital from its life insurance subsidiary to meet the new business strain. According to the life insurance subsidiary's business plan, non-availability of adequate capital can be a significant limiting factor for its growth under certain scenarios.

You have proposed a "financing structure" to facilitate the life insurer's growth and to significantly reducing the parent company's possible short term capital requirements to meet this growth. Since the life insurance subsidiary cannot easily avail itself of financial reinsurance, you have proposed an almost economically equivalent structure of the parent company issuing Asset Backed Securities (ABS) which can then be tailored to meet the needs of the domestic investors.

The proposed ABS structure is as follows:

The coupon and redemption payments from the parent company to the holders of the ABS would be contingent on profits emerging from a defined book of business in the life insurance company. The insurance company would only be required to calculate the value of the profits emerging each year and would have no obligation to pay a dividend/cash transfer to the parent company. If the profits emerge in the life insurance company the parent company is obligated to make payments to the holders of the ABS.

You may assume that the parent company is permitted by regulations to carry out such a transaction.

- A) Explain with a diagram, the cash flow profile of an ABS and make a specific reference to the proposed transaction. (10)
- B) What are the advantages and disadvantages of this proposed transaction to the parent company? (3)
- C) The insurance company writes only retail business and has four main lines of business:
 - 1) Conventional with Profits endowment contracts - written within a 90/10 gate.
 - 2) Immediate payment Annuities – written in the non-participating fund
 - 3) Unit Linked endowments with no guarantees – written in the non-participating fund
 - 4) Unit Linked endowments with guarantees– written in the non-participating fund

Describe the features (in terms of emergence of profit, sources of profit/loss) of each of the above lines of business which might make them suitable or unsuitable for securitisation in terms of the risk that are being transferred to the ABS investors.

In your view which line of business is most appropriate for securitisation? (8)

- D) i) Describe the calculations you would carry out to determine an attractive loan to value for investors and the parent company. (3)
- ii) What else might you do to enhance the attractiveness of the ABS to investors? (2)

- E)** After the transaction has occurred, the parent company has received a considerable sum of cash. It has earmarked the cash to provide capital to the insurance company when it requires such financing and for other cash flows relating to the financing structure. In the interim, the cash will be managed at the parent company level. Recommend a suitable investment strategy for the cash which has been received .Your recommendation must include a listing of the asset classes which might be appropriate. (6)
- F)** The investment manager for cash funds within the parent company has been given part of the assets to manage, with a benchmark such that the average duration of these cash assets must be 6 months or less. His investment universe includes:
- i) reverse repos
 - ii) units in money market mutual funds
 - iii) treasury bills
 - iv) commercial paper
 - v) bank time deposits and certificates of deposit
- Provide a description of each of the above investments. (5)
- What other investments might the investment manager request to manage these assets? (1)
- G)** Explain how the investment manager might construct a portfolio for managing these cash assets. (4)
- H)** Describe the basic structure of the fund management operation that the parent company may have (assume it can invest in equities, bonds and cash instruments) including back office and middle office roles. (5)
- [47]
