INSTITUTE OF ACTUARIES OF INDIA

EXAMINATIONS

3rd December 2022

Subject SA7 – Investment and Finance

Time allowed: 3 Hours 15 Minutes (14.45 - 18.00 Hours)

Total Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. ***Please read the instructions inside the cover page of answer booklet and instructions to examinees sent along with hall ticket carefully and follow without exception.***
2. ***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 is 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 candidate should answer the question with reference to Indian environment.***
3. ***Attempt all questions beginning your answer to each question on a separate sheet.***
4. ***Mark allocations are shown in brackets.***
5. ***Please check if you have received complete Question Paper and no page is missing. If so, kindly get new set of Question Paper from the Invigilator.***

AT THE END OF THE EXAMINATION

Please return your answer book and this question paper to the supervisor separately. You are not allowed to carry the question paper in any form with you.

Q. 1) A pension fund company XYZ Ltd., established two years ago, takes contributions from members of Defined Contribution pension Schemes (DCSs). It offers three types of investment funds as shown in table below:

Fund Name	Debt Allocation	Equity Allocation	MF
Salad	85% - 95%	5% - 15%	0.50%
Sauce	65% - 75%	25% - 35%	0.75%
Steak	50% - 60%	40% - 50%	1.00%

MF - Management Fee **as % p.a. of AUM** (Assets Under Management) is applied on daily basis. MF is the only fee charged by XYZ i.e. no entry/exit loads.

Four fund switches per year among the funds is allowed free of cost. On any day, a fund switch request received from a member is performed on the next day's fund NAVs (Net Asset Values).

Equities fell a lot and remained low for most of the time in past one year. Last year fund returns were negative across pension fund industry. XYZ fund performance came in lower quartile compared to its competitors. Consequently, few DCSs have withdrawn all their funds. To tackle this issue, XYZ is considering two steps:

I. Introduce Specialist Asset Classes (SACs) like Hedge funds and Managed Futures funds to enhance returns. SACs (or Alternative Investment Funds; AIFs), as an asset class, are used by most of the competitors whose performance came in top quartile. AIFs will replace a portion of Equity allocation to the extent of 0% - 5% in Sauce fund and 5% - 10% in Steak fund. For investing in AIFs, XYZ is assessing two Managed futures fund traders.

First trader uses Stop orders via Algorithmic trading to trade in equity index futures. She has a trend-following trading plan as stated below.

- Enter into a trade (long/short) when market breakouts (up/down side) occur during a consolidation (markets moving sideways) phase.
- Exit the trade on trend reversal.

Second trader is a non-directional (no-trend) trader who uses stock (equities) options. His options strategy is similar to the following example:

ABC Ltd. share has recently rallied from 600 to 700 in last month upon beating the market expectations in quarterly earnings. Post rally, in the past two weeks, ABC share is moving sideways in the range 684 – 720 and is expected to be trading in range bound manner for coming two months. He takes options long/short positions to hold until expiry of a one-month on ABC shares. Contract (Market lot) size is 1200 units.

Strategy

Long a European put at strike price 600 (option premium = 10).
Short a European put at strike price 650 (option premium = 20).
Short a European call at strike price 750 (option premium = 25).
Long a European call at strike price 800 (option premium = 15).

II. **Introduce investment guarantee**: Launch three funds similar to existing funds with PNG (Purchase NAV Guarantee) applicable for all contributions in to PNG funds (namely PNG Salad; PNG Sauce and PNG Steak). On partial/full withdrawal of funds by a member, current NAV of units from each contribution is compared with its PNG. Any shortfall is made good by XYZ.

Partial withdrawals and fund switches are done on FIFO (First-in-First-Out) basis. For all three PNG funds, MF is increased by 0.25% p.a. as Investment Guarantee Charge (IGC).

See table below for sample calculations; for a member with two contributions of 1000 each at NAVs 10 and 20. $Payout = \sum_{i=1}^{2} U_i Max(PNG_i; NAV_3)$

$$= 100\ Max(10; 15) +\ 50\ Max(20; 15) =\ 100\ (15) +\ 50\ (20) = 2500$$

Final payout = 2500 with shortfall of 250 paid from XYZ pocket.

Year	Contribution	NAV	PNG	Units	Total Units	Fund Value
1	1000	10	10	100	100	1000
2	1000	20	20	50	150	3000
3	Full withdrawal	15	NA	-150	0	2250

i) List forms of SACs/AIFs that XYZ could consider for enhancing returns. (3)

ii) Mention key differences between Hedge funds and Managed futures funds. (2)

iii) Write a short note on Algorithmic trading. (5)

iv) Discuss the usefulness of stop orders in executing the trading plan of the first trader (in an order driven market structure). (5)

v) Plot a rough diagram for the second trader's options strategy that shows the total payoff against the settlement price of the share (over a range 500 – 900). On the diagram, show the values of turning (kink) points and break-even points. (5)

vi) Suggest whether to employ first trader or second trader or both along with any modifications required in trading approach. (5)

vii) Mention the merits and demerits of introducing the PNG guarantee. (8)

viii) Suggest ways to modify the proposed PNG guarantee structure, which addresses the demerits stated by you. (5)

ix) Discuss in detail the ALM process to determine investment guarantee charge for the PNG funds. Your answer should include both approaches: deterministic and stochastic. (12)

[50]

Q. 2) Pension Regulator of a developing economy intends to set standards in the financial literacy of Retirement Advisors who offer pension schemes' products as part of financial planning to potential subscribers.

List the key topics/concepts to be included in the curriculum of Retirement Advisors Certification Examination. **[15]**

Q. 3) In a developing country, the regulations require each employee of the company to be provided with post retirement corpus which by nature is defined contribution but on smoothed basis. In this arrangement, the plan sponsor is the participant in the smoothed bonus fund underwritten by regulated insurers. Only large cap sponsors are allowed to offer such plans to their employees. Company once becoming large cap (market capitalisation more than 500 crore) will remain large cap for this purpose till perpetuity.

The funds offered for this purpose have the typical features of a smoothed bonus fund with some elements customised to meet the specific needs of the plan and to manage the risks to the insurer.

As per regulations, the contributions to the fund are made in proportion to fixed salary deducted from gross pay every month and is tax deductible. The withdrawals of plan members can occur only on retirement (age 60), termination or leaving of service or on death. In all cases the accumulated corpus of the member is paid by the plan by withdrawing equivalent amount from the fund. All contributions are required to be paid into the fund within 24 hours of deduction from salaries and no other withdrawal can be made by plan sponsors.

The investments are made by insurers on a segregated basis for each plan/corporate fund and may have different charging and bonus sharing structures basis the requirement of the plan. The fund operates on reversionary bonus philosophy with reversionary bonuses paid every anniversary with no terminal bonuses being paid. The reversionary bonus once declared cannot be reduced. The reversionary bonus is based on 10 yrs. G-sec rate with minimum guarantee of 3%. The G-Sec has been hovering between 5-10% for the last two decades. There is no sharing of demographic risk with employees and any shortfall/surplus remain within the fund and risks born by plan sponsor and insurer in same ratio as profit sharing.

However, following the run off the remaining fund is shared back with the plan sponsor using the same sharing formula.

The reversionary bonuses for fund are paid on accumulated benefits each year using the following formula:

- Reversionary Bonus for fund (t) = [Fund after bonus at previous anniversary *reversionary bonus declared (t)] + [∑contributions during year * reversionary bonus(t)* fractional year] – [∑withdrawals during year * reversionary bonus(t)* fractional year]

Last two terms relate to partial bonus credited and debited for contributions and withdrawals during the year.

- Fund for regulatory purposes = [Fund after bonus at previous anniversary + Reversionary Bonus for fund + ∑contributions during policy year] – [∑withdrawals during policy year]

For the employee the accumulated fund for benefit payment is given as:

- Reversionary Bonus amount for member (t) = [Fund after bonus at previous fund anniversary *reversionary bonus declared (t)] + [∑contributions during year * reversionary bonus(t)]

- Fund for benefit of employment termination = Fund after bonus at previous fund anniversary + Reversionary Bonus amount for member.
- no partial withdrawal allowed for the employee and full payment made on specific employment terminations described above.

The regulations requires that insurers expenses cannot be more than 1.5% of the fund in any year taking into account timing of contributions and withdrawals. The profit sharing cannot be more less than 80% of the regulatory surplus.

The regulatory surplus is defined as market value of assets less smoothed fund value at end of policy year. The withheld surplus is required to be invested in the fund and can be shared post runoff. However, if the regulatory surplus is negative, the same is required to be funded by plan sponsors and insurers in same proportion as the profit sharing. E.g. if profit sharing is 90:10 and there is a shortfall of 100 crores, then 90 crores will be funded by plan sponsors and 10 crores by insurer.

Note: Regulatory surplus is a mechanism to determine surplus/deficit and contribution required and to some extent reflect the combination of all risks. However, the benefit determination is independent of any regulatory surplus/deficit and is based on G-Sec rates.

Therefore, the only income earned by insurer is investment expenses and profit share at run-off.

i) Discuss the benefits and drawbacks of such a segregated investment vehicle for the post retirement plan rather than participating in a similar fund that is pooled with other retirement plans offered by insurer. (5)

ii) Identify the risks to the insurer in offering such product in the market and how it can alleviate some of these risks. (5)

iii) Identify the risks to the plan sponsors for this arrangement and how it can alleviate some of these risks. (5)

The portfolio of assets for this smoothed bonus fund is invested 30% in equities and 70% in fixed interest instruments. Recently there is a severe fall in the value of the equity market, the smoothed bonus fund is left considerably underfunded.

iv) Describe how the equity market fall has affected the stakeholders by this underfunded position. (10)

v) Discuss the actions, other than changing benefits or contributions, that could be considered by the pension plan or the insurer in order to:

a) alleviate this funding shortfall in the short term.

b) reduce the possibility of such funding shortfalls occurring in the future. (10)

[35]

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