# INSTITUTE OF ACTUARIES OF INDIA

## Subject SP4 - Pensions and Other Benefits

## November 2025 Examination

# INDICATIVE SOLUTION

**Introduction:**

The indicative solution has been written by the Examiners with the aim of helping candidates. The solutions given are only indicative. It is realized that there could be other points as valid answers and examiners have given credit for any alternative approach or interpretation which they consider to be reasonable.

**Solution 1:**

**i)** Objectives of State-Sponsored Pension System

- Give every older person a basic income. This is the key safety net, stopping the poorest and informal workers from becoming destitute.
- Help people maintain their usual lifestyle after they retire. Prevents a major financial shock for those who earned a middle or high income.
- Share the cost of retirement fairly between the young and the old. Stops young workers from being unfairly taxed to support an aging population.
- Encourage unregistered workers to join formal jobs and contribute. Strengthens the whole economy by expanding the tax-paying base.
- Gather large amounts of money to be invested in national projects. Creates a stable source of capital for infrastructure and economic growth.
- Protect retirees from losing their money in the stock market or living too long. Provides a secure guarantee against major personal financial risks.
- Make all rules simple and easy to understand for everyone. Ensures all citizens, regardless of education, can access what they are owed.
- Keep the system stable and trusted by all political parties. Guarantees the system will last and promises will be kept for future generations.
- Help people save their money consistently throughout their working life. A simple mechanism that prevents everyone from putting off necessary retirement savings. [6 marks]

**ii)** Impact of Moving to Means-Testing in Context of Population Ageing

- Means-testing targets pension resources to those with the greatest financial need, improving fiscal efficiency in a resource-constrained system.
- Reduces overall pension expenditure for the government, valuable for Country's budget balancing amid significant social spending demands.
- Risk of discouraging personal savings among lower-income workers due to benefits tapering off with increasing income (means-test trap).
- Administrative complexity increases, taxing public institutions' capacity for accurate income verification in rural and informal sectors.
- Potential stigma or lack of awareness could reduce uptake among the poorest elderly, especially vulnerable women and marginalized groups.
- Universal flat pensions are simpler, more widely accepted, and easier to administer in a diverse population like this Country.
- Population ageing in Country is accelerating, so means-tested benefits may face growing demand and pressure over time.
- Possibility of increased inequality if means-testing excludes significant numbers who lack formal income documentation but are needy as it Limits coverage risks among informal workers due to difficulties in income/assets assessment, requiring complementary measures for inclusion.
- May increase demand for voluntary or occupational pensions, which are currently underdeveloped in Country's largely informal labour market.
- Means-testing can act as an automatic fiscal stabilizer, adjusting pension payments in response to population ageing and economic fluctuations.
- It enables redistribution by progressively reducing benefits for higher-income groups, mitigating disparities from differences in life expectancy correlated with income.
- Encourages increased labor market participation and savings among older workers, as benefit eligibility depends on income/assets.
- Helps control fiscal costs associated with longevity increases by adjusting benefit levels according to need, supporting pension sustainability.
- Means-testing may be less politically popular, leading to resistance or reform instability in the long run. [10 marks]

**iii)** Long-Term Challenges for Sustainability and Adequacy

**Long-Term Challenges for Sustainability**

- Means-testing helps control pension costs by targeting benefits to those who need them most, which is vital as more people retire and population ageing grows.
- It reduces total pension spending, helping governments keep budgets balanced over the long term.
- Means-testing acts as an automatic stabilizer, adjusting pension payments as the number of eligible elderly or economy changes, maintaining system stability.
- Changes in political leadership or policy can cause uncertainty, with frequent adjustments to eligibility or payment levels disrupting planning.
- Economic recessions can push more elderly into poverty, sharply increasing claims and funding pressure on the pension system.
- The system needs strong administration and data capacity to properly assess eligibility and prevent fraud, which can be expensive and complex.
- Growing life expectancy, especially among wealthier groups, may increase costs unless means-testing is carefully designed to adjust for longevity differences.

**Long-Term Challenges for Adequacy**

- Strict documentation requirements cause many poor elderly, especially in rural or informal sectors, to be excluded or delayed from receiving pensions.
- Irregular work histories and informal employment limit eligibility verification, leaving vulnerable elderly without support.
- Means-testing can exclude needy individuals whose income fluctuates or who lack formal proof, risking higher old-age poverty levels.
- Reducing or withdrawing benefits as incomes rise may discourage personal savings, weakening total retirement security.
- Private or occupational pensions, which could supplement public pensions, often have low coverage and adequacy, especially outside formal employment.
- Social unrest or loss of trust can arise if many pensioners feel the benefits are unfair or insufficient.
- Frequent reassessment of policies is needed to balance controlling costs with maintaining benefit adequacy, complicating administration. [10 marks]

**[26 Marks]**

**Solution 2:**

**i)** Roles of Sponsor and Trustees

- Sponsor provides financing for the pension scheme through regular contributions.
- Sponsor is responsible for ensuring the scheme is sufficiently funded to pay promised benefits over time.
- Sponsor sets the scheme's benefit structure and proposes changes when necessary.
- Sponsor manages the impact of pension costs on the organization's overall finances.
- Trustees safeguard the interests of current and future scheme members.
- Trustees manage and invest scheme assets in line with agreed objectives and member security.
- Trustees administer benefits, ensuring they are paid correctly and on time.
- Trustees monitor compliance with all applicable laws and scheme rules.
- Trustees assess the sponsor's ongoing ability to support the scheme (covenant strength).
- Trustees engage with members and communicate scheme decisions transparently. [7 marks]

**ii)** Trustee Actions When Sponsor Is Weak

- Assess the deteriorating financial position of the sponsor and regularly monitor their covenant strength.
- Reduce investment risk by moving towards less volatile and more liquid assets where possible.
- Request the sponsor to provide additional security—for example, charges over company assets or guarantees from related parties.
- Seek contingency plans in case the sponsor is unable to provide future contributions or becomes insolvent.
- Prioritize funding for the legally required minimum benefit levels.
- Consider modifying or reducing future benefits for active members to reduce future liabilities.
- Communicate the risks and potential measures with all scheme members and stakeholders.
- Consult professional advisors (actuarial, legal, investment) to help formulate a robust response.
- Explore insurance options to secure member benefits if scheme funding allows.
- Monitor for any significant business changes at the sponsor (such as mergers, asset disposals) that might further affect support for the scheme. [7 marks]

**iii)** Challenges Balancing Members/Sponsor Interests

- Trustees must protect the security of promised member benefits even as sponsor constraints intensify.
- In case of insolvency, trustees have a duty to ensure that **pension liabilities are treated in accordance with insolvency laws**, where **employee-related benefits typically rank above unsecured creditors**. Ensuring these are settled appropriately becomes a key trustee responsibility, though recoveries may still be limited if the scheme is underfunded.

- Higher funding contributions can threaten the sponsor's financial stability, risking the continuity of both the scheme and the business.
- If the sponsor fails, the scheme may only be able to pay reduced benefits, especially if the scheme is underfunded.
- Recovery measures (such as longer funding plans or reduced accruals) require careful negotiation to be both fair and affordable.
- Member expectations are often for full security with no reduction, even during sponsor distress, leading to potential disappointment or mistrust.
- Regular, clear communication helps maintain understanding but can be challenging in uncertain circumstances.
- Trustees must comply with local pension regulations, which limit flexibility in funding and benefit changes
- Perceived or real inequality (e.g., between actives and pensioners) may lead to dissent within the scheme.
- Adverse publicity—if the scheme's difficulties become public—can undermine confidence among staff and the wider community.
- Final outcomes hinge on sponsor-trustee negotiations, which may require compromise that no party finds entirely satisfactory. [10 marks]

**[24 Marks]**

**Solution 3:**

**i)** Experience items in surplus analysis

- Higher than expected investment returns increase asset value, contributing positively to actuarial surplus. For example, a 3% higher return increases assets beyond expectations.
- Salary increases above assumptions raise projected liabilities because pension benefits are based on final salaries, reducing surplus or increasing deficit. For example, 2% higher salary growth increases liability estimates.
- Each item's effect is analysed separately to understand its impact on funding status.

[2 marks]

**ii)** Qualitative estimate of combined impact

- Initial surplus/deficit before deviations = Assets (500 crore) - Liabilities (600 crore) = Deficit of 100 crore.
- Higher returns increase assets by approximately 3% of 500 crore = 15 crore increase, improving funding
- Salary increases increase liabilities by approximately 2% of 600 crore = 12 crore increase, worsening funding.
- Net effect = 15 crore gain - 12 crore loss = 3 crore improvement.
- Adjusted surplus/deficit = Original deficit of 100 crore reduced to about 97 crore deficit.

[2 marks]

**iii)** Using surplus analysis to inform assumption setting

- Surplus analysis compares actual experience with assumptions and explains the reasons for gains or losses, helping actuaries test whether the assumptions remain appropriate.
- In this case, investment returns were 3% higher than expected, leading to a gain of about 15 crore, while salary growth exceeded assumptions by 2%, increasing liabilities by around 12 crore. The contrast provides valuable feedback on the realism of both assumptions.
- The higher investment return indicates strong market performance; however, this may reflect short-term volatility rather than a sustained improvement in long-term return expectations. Hence, the expected return assumption should not be raised automatically
- Instead, actuaries should review asset allocation, market forecasts, and interest rate trends before deciding if any adjustment is justified.
- The higher salary growth, if observed consistently over successive years, may indicate a structural shift in pay policy or higher inflation expectations, justifying a review of the salary escalation assumption.
- Conversely, if the 2% excess salary growth is a one-off event (e.g., due to exceptional performance bonuses), it should be treated as temporary rather than prompting a change in assumptions.
- Surplus analysis thus helps distinguish persistent trends from random fluctuations, ensuring that assumption updates are based on evidence rather than single-year anomalies.
- Quantifying the financial impact (15 crore gain vs 12 crore loss) helps assess which assumption deviation is more material to the funding position and should therefore receive greater attention in future valuations.
- The process supports setting assumptions that are balanced—realistic enough to reflect current experience but sufficiently prudent to maintain funding stability over the long term.
- By systematically reviewing surplus results, actuaries can avoid systematic bias (e.g., chronically understating salary growth or overstating returns), improving accuracy in liability measurement and contribution planning.
- Findings from the surplus analysis should be communicated and discussed with trustees and sponsors to reach consensus on assumption changes and ensure transparency in decision-making.
- Supporting documentation, sensitivity testing, and multi-year trend analysis further enhance the credibility and governance of the valuation process.
- In summary, using the current experience—positive asset performance offset by higher salary inflation—the surplus analysis provides data-driven insights that guide rational, balanced, and sustainable assumption-setting for future funding valuations. [10 marks]

**iv)** **Limitations of Surplus Analysis in Guiding Long-Term Funding Decisions**

- Surplus analysis is backward-looking, relying on past experience that may not predict future demographic, economic, or regulatory changes affecting liabilities and funding.

- Market volatility can cause the surplus to fluctuate significantly in the short term, potentially obscuring the plan’s true long-term financial health.
- Frequent or reactive adjustments to assumptions based solely on surplus movements can reduce consistency and distort the understanding of underlying scheme risks.
- Surplus may be inflated by temporary market gains that are not sustainable, leading to an overly optimistic view of the plan’s funding position.
- Surplus measurement may fail to fully capture emerging long-term risks such as longevity improvements, changes in workforce composition, or inflation shifts.
- Difficulties in separating one-off anomalies from persistent trends can cause inappropriate assumption changes, either over- or under-correcting.
- Accounting and valuation methods can distort surplus figures, e.g., due to smoothing techniques or asset-liability mismatches, making interpretation for funding decisions challenging.
- Surplus analysis alone ignores the qualitative factors like sponsor covenant strength, future contribution capacity, and regulatory risk, which are crucial in long-term funding strategy.
- Long-term funding decisions require forward-looking assessments, including scenario analysis and stress testing, which surplus analysis does not provide
- Use of surplus to reduce contributions prematurely based on favorable short-term analysis can harm long-term funding sustainability.
- Surplus may be legally or contractually constrained, limiting its effective use and therefore reducing its relevance in guiding flexible long-term funding decisions.
- Communication complexity of surplus analysis results to trustees and sponsors can hinder effective decision-making, especially in volatile or uncertain environments. [10 marks]

**[24 Marks]**

**Solution 4:**

**i)** Factors Influencing Pension Scheme Design and Choice

- The employer’s financial strength and risk appetite determine the extent of benefit promises that can be supported.
- Multinational groups may wish to harmonise benefit structures across countries for administrative simplicity, but must adapt to local requirements.
- Local pension regulations, funding requirements, and tax treatment strongly influence feasible plan designs.
- Countries with strict funding and accounting standards may discourage DB plans due to cost volatility.
- Age profile, mobility, and employee expectations differ by region, influencing whether long-term or portable benefits are preferred
- In high-turnover markets, DC or hybrid designs may be more appropriate.
- Inflation levels, investment opportunities, and interest rates affect affordability of guarantees and influence the design of benefit accrual or contribution formulas.
- The extent of state pension provision determines the adequacy required from occupational schemes and affects the balance between employer and member contributions.
- Multi-currency liabilities and IFRS or local accounting standards may drive a preference for schemes with predictable costs
- DB schemes offer member benefit security but transfer investment, longevity, and inflation risk to the employer, often resulting in volatile and high costs
- DC schemes provide predictable employer cost but transfer investment and longevity risks to members, creating uncertainty in retirement income.
- Risk-sharing or hybrid schemes distribute risk between sponsor and members (e.g. shared investment outcomes, conditional indexation), balancing cost stability with moderate benefit security.
- The capacity for governance, administration, and communication varies across regions, influencing the complexity of arrangements that can be supported.

- Overall, the scheme design must balance affordability, sustainability, member equity, and compliance while reflecting each jurisdiction's economic and regulatory constraints.

[10 marks]

**ii)** Funding Methods and Their Implications

**Purpose of funding**

To ensure that the assets held by the pension scheme are sufficient to meet the accrued liabilities as they fall due, while maintaining stability of contributions and fairness between generations of members and sponsors

**Common funding methods**

- Projected Unit Credit (PUC) – contributions reflect the current service cost based on projected final salaries. It provides cost recognition aligned with benefit accrual but can result in rising contribution rates as the membership matures, leading to volatility for closed or ageing schemes.
- Attained Age / Entry Age Normal methods – aim to spread the cost of benefits evenly over the members' working lifetimes. These methods promote contribution stability and intergenerational fairness but are less responsive to emerging experience or demographic changes.
- Aggregate funding – determines a single level contribution rate to finance all future benefits for existing members. It can provide stability in the short term but may be sensitive to membership changes and experience deviations, leading to future funding strain.

**Implications of different methods**

- Contribution stability: Methods with longer-term smoothing or averaging (e.g. Entry Age or Attained Age) reduce volatility in contribution rates but may delay recognition of adverse experience, potentially leading to funding shortfalls.
- Intergenerational equity: Methods that allocate costs evenly across generations (e.g. Entry Age Normal) improve fairness but may still result in transfers of surplus or deficit between cohorts depending on actual experience.
- Sponsor risk exposure: More prudent funding methods reduce the risk of sponsor insolvency and enhance benefit security but increase short-term cash flow demands. Conversely, under-funding approaches expose members to benefit insecurity and heighten sponsor risk in adverse markets.
- Regulatory variation and practical considerations: Different jurisdictions impose varied funding rules (e.g. solvency vs ongoing basis) and actuarial assumptions, leading to inconsistency across schemes. The use of asset-liability matching, prudence margins, and smoothing policies significantly influences the long-term stability and sustainability of contribution patterns. [8 marks]

**iii)** Key Risks and Risk-Management Framework

**Financial risks:**

Investment, interest rate, inflation and currency risks affect both the level and timing of contributions and benefits. Adverse investment performance or asset-liability mismatching may reduce the return on assets, increasing the sponsor's funding burden and threatening benefit security. Currency movements between asset and liability currencies add further volatility.

**Demographic risks:**

Uncertain longevity trends and regional mortality differences influence the level and duration of benefit payments. Longer lifespans can increase liabilities in DB schemes and raise the risk of members outliving their assets in DC arrangements. Unexpected withdrawal or early retirement patterns also affect contribution incidence and asset adequacy

**Operational risks:**

Errors in data, valuation, or benefit administration—especially following scheme mergers—can distort funding assessments and lead to incorrect benefits. Weak internal controls or reliance on outdated systems may compromise benefit security and stakeholder confidence.

**Regulatory and legal risks:**

Frequent changes in funding, solvency, or disclosure standards across jurisdictions may alter contribution requirements and minimum benefit levels. Differing tax or accounting treatments affect the timing and measurement of both assets and liabilities, influencing the apparent funding position.

**Sponsor covenant risk:**

The employer’s financial position directly affects its ability to maintain contributions and honour future obligations. Insolvency or business restructuring may reduce benefit security, particularly where scheme protection mechanisms differ across countries.

**Risk-management framework:**

An effective framework should include:

- Systematic identification, quantification and prioritisation of key financial, demographic and operational risks across all schemes;
- Mitigation tools such as asset diversification, liability-driven investment (LDI), longevity hedging and currency matching;
- Governance arrangements clearly defining roles and responsibilities of corporate management, trustees and local advisers;
- Transparent communication and reporting to stakeholders on funding and risk positions; and
- Regular reviews to ensure adaptability under evolving market, demographic and regulatory conditions.

[8 marks]
**[26 Marks]**

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