

INSTITUTE OF ACTUARIES OF INDIA

CP1A - Actuarial Practice

May 2026 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)

1. Gathering information about conglomerate using public domain like company website, published accounting results etc.
2. Pre-project meeting with the conglomerate to ensure that the situation has been appropriately understood.
3. Understanding the risk appetite of the conglomerate in terms of risk tolerance, ways of managing risk, preference between equity and debt in terms of riskiness etc.
4. Understanding the general style and culture of the conglomerate through initial meeting at the conglomerate's premises etc.
5. Aware about any potential conflicts of interest and implement appropriate safeguards around it.

[2]

ii)

1. Indicative advice: Offering an opinion about situation without entire investigation like response to a direct verbal question.
2. Factual advice: Advice provided after research of information like company accounts, regulations etc.
3. Recommendations: Recommendation which is consistent with requirements, made after research of information, modelling of forecasts, comparison of alternative options and might include peer review.

[3]**[5 marks]****Solution 2:**

i) The reasons for economic phenomenon pertaining to yields on bonds are:

1. The expectation of lower inflation in future might lead to lower yields on government bonds.
2. The reduction in interest rates as a part of monetary policy might be viewed as monetary easing with estimate of fall in future short term interest rates at all times in future leading to fall in long term government bond yields.
3. The lower than expected fiscal deficit might reduce the supply of government bonds due to fall in government borrowing leading to fall in yields.
4. The increase in demand for long term government bonds by institutions majorly insurance companies and pension funds might lead to increase in price of government bond and fall in yields.
5. The reduction in attractiveness of other asset class like equity might lead to increase in demand and price of government bonds and fall in yields.
6. The appreciation of domestic currency might lead to currency gains for foreign investors in addition to bond returns which might increase the demand of long term government bonds and fall in yields.
7. The high economic growth of the country might lead to future reduction in government borrowing and fall in government yields.
8. The daily economic news like fall in oil prices for country dependent on import of oil etc. might reduce the government borrowing and lead to fall in yields.
9. The increase in perceived riskiness of corporate bonds due to economic recession, worse quarterly earnings call, insolvency events of few corporates etc. might lead to widening of gap between corporate yields and government yields.
10. The reduction in marketability of corporate bonds might lead to increase in illiquidity premium on corporate bonds and widening of gap between corporate bond yields and government bond yields.
11. The increase in supply of corporate debt due to depressed equity markets might lead to fall in demand of corporate bonds and increase in corporate bond yields which widens the gap with government bond yields.

[4]

ii) The ways for indirect investment in property are:

1. Closed-ended investment trust investing in property
2. Open-ended unitised trust investing in property
3. Property company shares

[1.5]

iii) The reasons for indirect investment in property as compared to direct investment are:

1. Access to specialist expertise in property as current team might not have sufficient knowledge about investment in property
2. Easy and quick way to gain exposure in property
3. Holding will be more marketable as compared to direct investment
4. Possible tax advantages
5. Holdings are divisible
6. Gain exposure to large or unusual property where direct investment may be difficult or impossible
7. Possible lower management cost due to economies of scale from managing large indirect property investment
8. Ability to enhance expected returns due to narrowing of discount to NAVs for investment trusts

[2.5]

iv) The reasons for rising equity market due to declining bond yield scenario are:

1. The fall in yields on bonds might signal higher economic growth in future leading to rise in level of equity market.
2. The profitability of corporates might also increase due to fall in corporate bond yields leading to rise in level of equity market.
3. The discounting factor used in valuation of equity might also fall leading to rise in present value of dividends and level of equity market.
4. The fall in returns from bonds might increase the attractiveness of equities from investor's perspective which might lead to increase in equity demand and level of equity market.
5. The fall in corporate bond yields might increase the supply of corporate bonds and reduce the supply of new equity shares leading to rise in level of equity market.

[2]**[10 marks]****Solution 3:**

i) The regulatory requirements that an electricity stock exchange might need to fulfil to obtain the license are:

1. Exchange has adequate capital to cover their liabilities and manage the exchange services
2. Buyers and sellers on the exchange also have sufficient financial resources to meet their obligations
3. Ensuring competency and integrity of key personnel managing the stock exchange
4. Exchange has proper code of conduct and rules for stock exchange dealings
5. Exchange should have proper squaring off transactions mechanism and adequate margin to minimise the defaults
6. Exchange needs to ensure that the rules are enforced to prevent fraud
7. Exchange needs to have a grievance redressal mechanism and compensation scheme in case of default from either buyers or sellers
8. Exchange needs to have a process for maintaining details about trade like price, volume and time of trade and buyers and sellers involved
9. Exchange also needs to develop a process for onboarding of new buyers and sellers

10. Exchange needs to maintain transparency in trades conducted on the exchange
11. Exchange also needs to ensure that the trade is executed in reality as agreed between buyers and sellers
12. Exchange might require risk management framework to be in place
13. Exchange needs to have a fair and efficient price discovery without any manipulation
14. Exchange needs to have technological system in place to manage the trades
15. Exchange might also need to ensure that the system is not susceptible to cyber attacks
16. Exchange needs to have a process for regular requirements from members to check their eligibility on regular basis
17. Exchange needs to establish process to regularly comply with all the regulatory provisions
18. Exchange might need to demonstrate good corporate governance

[5]

ii) The impact of climate change and environmental changes on the operation of electricity stock exchange are:

1. The extreme weather like heatwaves might lead to surge in demand for electricity leading to price fluctuations on electricity exchange.
2. The weather condition like low rainfall might lead to lower generation of hydro electricity leading to volatility of price on electricity exchange.
3. The rise in renewable sources of electricity like solar or wind energy might lead to changes in daily electricity generation. This necessitates daily dealings on electricity exchange to trade excess electricity or meet deficit in electricity leading to price movements.
4. The electricity stock exchange might want to differentiate the trading between renewable and non-renewable sources of electricity.
5. The electricity stock exchange might have to introduce the mechanism to verify that the green electricity traded is generated using renewable sources.
6. The electricity exchange might need to increase the usage of green electricity in running its operation.
7. The environmental impact in communication by exchange also needs to be considered like volume of paper consumed which is never read.

[5]

[10 marks]

Solution 4:

i) The risks that might emerge from the proposal for various stakeholders are:

1. State government
 1. Increase in cost of development of airport like high cost of raw materials, labour etc.
 2. Increase in cost of running the airport
 3. Delay in development of airport due to labour strike, approvals from various authorities etc.
 4. Lower revenue than anticipated due to unattractive location, lower flight operation, unwillingness of travellers to travel from new airport etc.
 5. Delay in managing capital to fund the new airport or default of construction company
 6. Fraud by construction company like inflating the invoices etc.
 7. Political risk like opposition from local residents due to cost, ecological damage etc.
2. Travellers
 1. Insufficient airport facilities like lack of digitisation leading to delay in completing the boarding formalities
 2. Unattractive location like new airport located far from the main city area
 3. Increase in cost of flight tickets like higher airport usage fees
 4. Poor new airport connectivity like train or metro
 5. Increase in confusion if airport name is not clearly specified at the time of flight booking
3. Airlines

1. Increase in cost in managing flight operation from multiple airports
2. Increase in operational challenges in managing multiple airports
3. Lower flight ticket sales due to unattractive location, poor airport connectivity, high flight ticket prices etc.
4. Bad reputation in case of poor airport transfers for travellers with connecting flights at different airports
4. Local residents
 1. Loss of biodiversity due to clearing of land for development of airport
 2. Inconvenience due to relocation of local residents during land acquisition
 3. Increase in air and noise pollution due to higher airplane activity and fall in quality of life
 4. Exacerbate the above problems due to building new infrastructure around airport like train or metro to improve airport connectivity etc.
5. Existing airport operators
 1. Lower revenue than estimated due to increased diversion of passengers to new airport
 2. Loss of monopoly leading to higher negotiating power with airlines which might lead to fall in revenue
 3. Higher cost of renovation to compete with new airport facility
 4. Lack of adequate utilisation of existing infrastructure leading to redundancies and lower economies of scale

[10]

ii) The contents that can be included in risk portfolio or register are:

1. The risk portfolio or register helps to categorise the risks to which the business is exposed.
2. For example, the risk might be categorised as financial risks (market, liquidity, credit and business) or non-financial risks (operational and external)
3. Against each risk a quantification of both impact and probability will be recorded.
4. The quantification might also be a subjective assessment on a scale of 1 to 9 for each risk.
5. The product of the impact and probability gives an indication of the relative importance of the different risks.
6. The risk portfolio can be used to indicate how the risk has been dealt with like:
 1. avoided
 2. accepted (and how much capital is required to support it)
 3. diversified (and a revised assessment of the remaining combination of risks)
 4. mitigated (and a revised assessment of the remaining risk) by internal transfer or transfer to third party
7. The assessment would be carried out with and without possible controls.
8. This enables the efficiency of risk controls to be assessed against their cost.
9. For risk which are retained, it would also include:
 1. details of control measures and their impact
 2. the risk owner
 3. the Board committee or senior manager with oversight of the risk (key strategic risks overseen by the full Board)
10. The risk portfolio can help to identify any concentration of risk and highlight the need for management action in these areas.

[5]**[15 marks]****Solution 5:**

The expense analysis to determine expense loadings for the new non-participating endowment product will be performed as follows:

1. Employee remuneration cost:
 1. The different departments will be involved in various classes of business which needs to be split between different classes of business based on an approach and identify the expenses pertaining to non-participating endowment.
 2. For example: The staff timesheet can be used to allocate expenses between different classes for sales, new business data entry and underwriting.
 3. The expenses of finance, actuary and other support function departments can be split between different classes based on allocation of other departments to different classes.
 4. The employee remuneration cost pertaining to sales department can be loaded as percentage new business written.
 5. The employee remuneration cost pertaining to new business data entry can be loaded as initial per policy expense.
 6. The employee remuneration cost pertaining to underwriting can be loaded as percentage of new premium written or sum assured if underwriting varies with size of policy or initial per policy expense.
 7. The employee remuneration cost pertaining to finance, actuary and other support function departments can be split between loadings pertaining to initial and renewal expenses based on allocation of other departments.
2. Lease cost:
 1. The lease cost can be allocated to different departments based on floor space used by these departments.
 2. This can be further identified for non-participating endowment and split into various expense loadings based on employee remuneration cost of these departments.
3. IT cost:
 1. The regular IT cost can be allocated to different departments based on computer time used by these departments.
 2. The one-off IT cost like purchasing new software etc can be converted into regular cost based on estimated working lifetime.
 3. This can be further identified for non-participating endowment and split into various expense loadings based on employee remuneration cost of these departments.
4. Medical underwriting cost:
 1. The medical underwriting cost can be split by mapping medically underwritten proposals to different classes of business and identifying cost pertaining to non-participating endowment.
 2. This can be loaded as percentage of premium or sum assured if medical underwriting varies with size of policy or initial per policy expense.
5. The expense inflation to be used in loading will need to be considered.
6. The expense loadings used in pricing might be modified for competitive reasons.
7. The extent of cross-subsidies between large and small policies needs to be considered if maximum expenses are based on percentage of premium or sum assured instead of per policy.
8. The extent of cross-subsidies between initial and renewal expenses will also need to be considered.

[8]

Solution 6:

i) The investment controls that might be included by the scheme trustees are:

1. restriction on the type of assets that can be used for investment
2. restriction on the maximum proportion that can be invested in different assets
3. restriction on the maximum exposure to a single counterparty
4. restriction on the degree of deviation from the strategic asset allocation
5. requirement to match asset and liabilities by currency
6. requirement to hold a mismatching reserve
7. limit on the extent to which mismatching is allowed

8. restriction on type of derivatives that can be used
9. requirement to use derivatives only for the purpose of hedging and not for speculative purposes
10. rules on custodianship of assets
11. restriction on investments to follow ESG framework
12. restriction of maximum holdings in certain sectors
13. restriction on amount of any type of asset that can be considered for demonstrating solvency
14. requirement of holding minimum proportion in certain assets like government bonds
15. restriction on self-investment

[4]**ii)**

The suitable assets matching the liabilities that might be part of the investment strategy are:

1. Equities:
 1. a good match for current pensioners' benefits and deferred members' benefits as pension payments will increase by domestic equity returns
 2. a close match for increase in salary of active members in the long term
 3. might be used to match some expenses
2. Derivatives:
 1. buying put options at prevailing level of equity for current pensioners' benefits to meet the guarantee of no reduction in pension payment in case of negative equity returns
 2. entering into a customised swap contract with an investment banker where fixed payments are exchanged with domestic equity returns with a floor of zero returns
3. Domestic government fixed interest bonds:
 1. might be used to match fixed payments under customised swap contract
4. Domestic government index-linked bonds:
 1. might be used to match some expenses
5. Property:
 1. inflation linked rent might be used to match some expenses
 2. might help to manage risk due to diversification benefit with other asset classes
6. Cash and money market instruments:
 1. it can be reduced in case of steady flow of contributions from active members
 2. used to meet immediate cashflows like immediate pension payments, some expenses etc.
7. All the above investments to be based on domestic currency as contribution, liabilities and expenses are denominated in domestic currency.
8. Overseas equities might help to manage risk due to geographical diversification.

[6]

iii) The reason for regular review of investment strategy by trustees are:

1. The investment manager's fund performance may be out of line with that of other funds.
2. The care should be taken that the other funds are subject to same constraints as investment manager's fund.
3. The returns needs to be compared over long term to ensure that the returns are not subject to random fluctuations.
4. If the performance is out of line, the trustees should consider changing the investment manager.
5. The funding level or free assets may have changed significantly due to large inflow of contributions, large outflow not matched with inflow etc.
6. The change in taxation provisions might also lead to change in funding level.
7. The matching of assets and liabilities might have changed significantly within a year.
8. There might be a change in regulation related to investment which might impose few investment controls like restriction on certain type of assets etc.

9. The level of contributions might have changed leading to mismatch.
10. The higher expected level of contributions might reduce the necessity for cash or money market instruments.
11. The nature and term of pension payments might have changed leading to mismatch.
12. The cost of entering into derivatives might have changed leading to regular review.
13. The fund can depart from matching strategy during regular review to improve investment returns in case of good funding level.

[5]

iv)

1. Regular contributions and maintaining the pension fund leads to stable funding cost over the member's working lifecycle.
2. The proposal of pay-as-you-go basis may lead to liquidity problems of managing cash on short notice.
3. For example: The members requiring a transfer value on resignation might lead to liquidity problems.
4. The funding of pension benefits on regular basis might be a standard approach in financing a scheme.
5. The funding on regular basis might be expected by members.
6. There may be tax advantages in regular contributions to pension scheme which might not be available on pay-as-you-go basis.
7. For example: The exemption of tax on regular contributions to pension scheme and investment returns earned from this fund.
8. The regular contributions to pension scheme might be required as per regulations.
9. The pay-as-you-go basis provides freedom to company in managing the timing of contributions.
10. The pay-as-you-go basis does not provide security of member's benefits.
11. The member's benefits might not be taken care of under pay-as-you-go basis in case of insolvency of company.
12. The competitors might be following funded approach which might necessitate funding approach to attract talent.
13. The funding in advance might increase the risk that funds might not be sufficient to meet the benefits.
14. For example: The sudden fall in asset value might lead to mismatch between assets and liabilities and insufficiency to meet the benefits.

[5]

[20 marks]

Solution 7:

i) The special terms that might be offered by a life insurance company to applicants with substandard health are:

1. An additional premium as compared to standard lives might be charged in line with additional risk.
2. A reduction in benefit as compared to standard lives in line with additional risk.
3. An exclusion clause which excludes benefit payments due to specified causes.
4. A denial of benefit due to specified causes during lien period with reinstatement of full benefits after the end of lien period.

[2]

ii) The mechanism of catastrophe bonds is as follows:

1. The catastrophe bonds help to transfer the catastrophe risk to financial markets.
2. This involves converting the catastrophe risk into a financial security.
3. A Special Purpose Vehicle (SPV) is established which provides the link between reinsurance company and investors.

4. The investors buy the catastrophe bonds from SPV in exchange for money.
5. The payment of interest and repayment of capital is contingent on specified event not happening.
6. For example: a particular natural disaster of specified magnitude not happening.
7. The payment of interest can be viewed as premium paid by reinsurance company to cover the catastrophe risk.
8. If the contingent event occurs, then SPV utilises the investor's money to cover the reinsurer's claims arising from the event raised by general insurance companies.
9. If the contingent event does not happen, then investors receive the interest and capital is repaid.
10. This is a high risk investment for investors as they might receive zero returns and lose their entire capital.
11. The catastrophe risk is not correlated with market risk which provides diversification benefits for investors.
12. The financial markets might have greater capacity to accept this risk.

[5]

iii) The longevity swap can be used to manage longevity risk under annuities as follows:

1. The insurance company is exposed to the risk of unknown future annuity outgoes.
2. The aim of the insurer is to hedge this unknown future annuity outgoes with a fixed level of future outgoes.
3. The longevity swap agreement between insurer and bank or reinsurer can help to manage this risk.
4. The bank or reinsurer would pay a floating series of payments linked to the actual annuity outgoes paid by the insurance company.
5. The insurance company would pay a fixed series of payments agreed at the commencement of the swap.
6. These payments reflect the best estimate cost of annuity from the perspective of bank or reinsurer along with risk premium.

[3]

iv) The reasons for availing alternative risk transfer as compared to traditional reinsurance are:

1. availability of risk transfer that might otherwise not be available through traditional reinsurance
2. cheaper in cost as compared to traditional reinsurance
3. better tax advantages
4. higher support to solvency margins
5. greater security of payment as compared to traditional reinsurance
6. better management of risk as compared to traditional reinsurance

[2]

[12 marks]

Solution 8:

The changes that might occur in the investment portfolio of individual investors are:

1. The decrease in equity investment as investors might sell equities before imposition of higher capital gains tax.
2. The exposure to cash and money market instruments might increase due to proceeds from equity investment.
3. The exposure to other asset classes which now provide better post tax returns might increase.
4. The investors might not engage in selling due to additional fall in value of equity returns triggered by short term selling.
5. The short term selling by individual investors might lead to fall in value of equities which increases the attractiveness and additional buying by investors in equities.
6. The goal based investment of individual investors might not change.

7. The investors might increase exposure to indirect investment via mutual funds or ETFs as portfolio rebalancing within these funds might not be impacted which could lead to higher post tax returns in comparison to post tax returns from rebalancing of direct investments by investors.
8. The investor might increase exposure to riskier assets from safer assets in order to maintain similar post tax returns.
9. The investors may increase the holding period of equities in order to defer the crystallisation of gains and defer the capital gains tax.
10. The investors might increase exposure in overseas equity investment if taxation on overseas investment is favourable.
11. The investors might engage in derivatives in long term for portfolio rebalancing from equity investments in order to delay capital gains taxation.
12. The frequent buying and selling of equities by individual investors might reduce based on daily economic news which might ultimately improve long term post tax returns from equities.

[5 marks]

Solution 9:

The salary growth experience can be analysed by the pension scheme as follows:

1. The data of members active as at the current and previous year needs to be gathered to perform the analysis.
2. The members that have left the scheme during the year or new members that have joined during the year will be excluded from the analysis.
3. The increase in salary can be bifurcated into inflation-related and promotion-related growth.
4. The actual average salary as at previous year and current year can be compared to arrive at actual average salary growth.
5. This comparison can be performed based on various age groups as salary growth might reduce with increase in age.
6. This can also be performed based on year of joining as promotion-related salary growth might differ based on number of years of service.
7. This can also be based on employee designation or similar departments.
8. The actual average salary growth can be compared with expected average salary growth.
9. The inflation-related salary growth during the year can be identified after discussion with the employer to arrive at promotion-related salary growth.
10. The inflation-related salary growth can also be based on salary inflation indices.
11. The exclusion of inflation-related salary growth can be used to compare actual promotion-related salary growth with expected promotion-related salary growth.

[5 marks]

Solution 10:

i) The reason for fall in surplus from cyber insurance are as follows:

1. There might be an increase in frequency of cyber related claims like hacking of company data etc.
2. There might be an increase in amount of cyber related claims like high regulator fines, sophisticated longer duration cyber attacks etc.
3. There might be new types of cyber related claims which was not factored in pricing but the company is liable for such claims like crypto scams for companies having exposure to crypto investments etc.
4. The cost of reinsurance might have increased which have been passed on to customers with delay leading to fall in surplus.
5. The increase in amount of claims below retention limit might lead to lower recoveries and fall in surplus.
6. The lower investment returns on reserves and shareholder capital might reduce the profits for the company.

7. The change in regulations necessitating cover for new types of claims under the existing contract without flexibility to change the premium might lead to additional claim cost and fall in surplus for the company.
8. The increase in expenses due to higher than expected inflation might lead to fall in surplus.
9. The increase in claims cost pertaining to cyber incident investigations etc. might increase the expenses and reduce the surplus.
10. The increase in commission for distributors to acquire new business might increase commission cost and reduce the surplus for the company.
11. The increase in administration cost due to higher salary growth etc. might lead to fall in surplus.
12. The fall in new business might increase per policy expense which might lead to fall in surplus.
13. The change in reserving requirements due to change in claim experience and/or expenses might lead to fall in surplus.
14. The increase in claims due to catastrophe event like large scale cyber attack impacting multiple stakeholders might lead to fall in surplus.
15. The lower than required revision in premium to maintain the similar profit margin due to competitive pressure might lead to fall in surplus.

[7]

ii) The reasons for undertaking the analysis of surplus by the general insurance company are:

1. determine the assumptions which are the most significant
2. identify the financial effect of writing new business
3. provide management information
4. assist in determining executive compensation schemes
5. provide detailed information in company's accounts
6. provide information about trends in experience to take suitable actions
7. show the financial effect of divergences between valuation assumptions and actual experience
8. assist in distribution of profits by identifying regular and one-off surplus
9. validate the calculations and assumptions used

[3]

[10 marks]
