

# The Institute of Actuaries of India

## Subject CA1 – Paper1 Core Applications Concepts

**24<sup>th</sup> May 2007**

### **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 examiner have given credit for any alternative approach or interpretation which they consider to be reasonable.

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**Chairperson, Examination Committee**

- Q.1)**
- The two systems are known as quote driven system and order driven system
  - Quote driven system
  - Market makers quote both buying and selling prices (i.e. bid and offer prices respectively) at which they are prepared to deal at least upto a certain volume of shares
  - Market makers will quote higher prices for selling than they will for buying a particular share
    - The difference is known as the spread and represents profit for the market maker. The market maker does not charge an explicit commission for executing the deal.
  - The size of the spread depends on the marketability of the shares being traded
- Order driven system
- In this system, buyers and sellers are matched, usually electronically
  - Stockbrokers can observe prices at which deals are being made on the system and can make an offer to buy or sell at a certain price for their own account.
  - This electronic system is increasingly becoming the norm in stock exchanges around the world
  - The system will show bid and offer prices. An investor has the choice to accept the offers displayed on the system or enter his offer or bid onto the system.
  - This system has led to narrowing of the spread between buying and selling prices.

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- Q.2)**
- The life insurance company will require several types of general insurance cover to manage risks arising from its financial and business operations as well as providing some general insurance cover to its own employees.
  - Liability insurance to indemnify the company from legal damages in the form of compensation to a third party arising out of some form of negligence. Such covers include
    - Employers' liability (e.g. compensating an employee or their estate for accidents caused by negligence of the employer or other employees)
    - Motor third party liability (e.g. third party claims from company owned cars involved in accident)
    - Public liability (e.g. compensating a third party for damages from say, a falling object within the company's office)
    - Product liability
    - Professional indemnity (e.g. insurance for Directors and Officers of the company)
  - Property damage insurance to protect from loss of, or damage, to own material property. Examples include, the company insuring its fixed assets, cars, other vehicles, other office property and other own property.
  - Financial loss insurance
    - Pecuniary loss (e.g. borrower defaulting on interest payment)
    - Fidelity insurance (e.g. employees involved in financial fraud, cash in transit)
    - Business interruption (e.g. losses from disruption of business due to fire)
  - Fixed benefits (e.g. health insurance and personal accident insurance for employees)

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**Q.3)**

- a) As the market moves from a controlled regime to a liberalized regime the authorities would like to promote an efficient and orderly market.

The other reasons for regulating the market would be

- Protection of customer interests
- Maintain confidence in the insurance industry
- Correct any perceived market inefficiencies

- b) Areas covered by regulation could be

- Information asymmetry
  - This can be reduced by insisting that all companies disclose full information about its products in an understandable language
  - The regulator can create customer awareness via education programmes
- Negotiation
  - As the market is liberalized it is important that there is recognition of weakness of individuals in negotiating a deal with a large institution.
  - This can be addressed by regulation of selling practices (e.g. offering a “free look” period)
- Conflicts of interest
  - Protection of information about third parties (e.g. rules governing sharing of customer databases)
- Capital adequacy
  - Ensure that companies meet robust capital adequacy norms to cover liabilities
- Competence and Integrity
  - Ensure competence and integrity of companies’ management and salesforce by putting in place measures such as “fit and proper” person concept for management, compulsory certification of sales force etc.
- Schemes to provide compensation to customers (examples including setting up a system of ombudsmen and policyholder protection fund)

- c) Various forms of regulation

- Prescriptive – this form of regulation has detailed rules setting out what may or may not be done
- Freedom of Action –
  - A company can do what they want
  - But the company will have to sufficient information for the regulator to check that it is being properly managed.
- Outcome based form of regulation can allow freedom of action but prescribes the outcomes that will be tolerated.

- d) Under a statutory regulatory regime the government sets out the rules and implements and monitors them.

Advantages

- Less open to abuse and may enjoy higher public confidence
- The regulatory body could be run efficiently if economies of scale can be achieved by organizing itself by function (e.g. capital adequacy, market

conduct) rather than by type of business

Disadvantages

- Can be more costly and inflexible than other forms of regulatory regimes
- Regulatory body could be influenced more by those it is regulating rather than those of the customer
- In general attempts by government to improve market efficiency via statutory regulatory regime have usually failed.

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**Q.4)**

a)

- Status of member
- Age of member
- Retirement age
- Gender of member
- Marital status
- Age of spouse
- Past service period
- Current salary

b)

- Must be valid, meet requirements of rigor and adequately documented
- Should be capable of reflecting the risk profile of the scheme adequately
- The parameters used must allow for all those features of the business being modeled that could significantly affect the advice being given
- Inputs to the parameter values should be appropriate and reflect any special features
- Should be consistent with generally accepted economic principles
- The workings should be easily communicable and results clearly displayable
- The output should be capable of independent verification for reasonableness
- Should not be overly complex or time consuming or expensive to run
- Should be capable of development and refinement
- Should be capable of being implemented in a range of ways

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**Q.5)**

a)

- Controlling economic growth
  - Low real interest rates can reduce the cost of borrowing and hence increase the level of consumer spending.
  - This can lead to increase in level of economic growth.
  - Likewise, increasing interest rates can slow down economic growth.
- Controlling inflation
  - Increasing interest rates can lead to reduction in
    - Quantity of money demanded.
    - Aggregate demand
  - This can reduce inflation.
  - Likewise, reduction in interest rates can lead to inflationary pressures.
- Controlling the exchange rate
  - If interest rates in one country are low relative to other countries, international investors will be less inclined to deposit money in that country.
  - This decreases demand for the domestic currency and tends to decrease the exchange rate.
  - Converse applies if domestic rates are relatively high.

- b)
- The effect of an increase in short term interest rates on long term bond yields is not clear cut.
  - Expectations of higher future short term interest rates can increase long term bond yields according to the expectations theory of the yield curve.
  - However, investors in long term bonds may interpret a rise in interest rates as a sign of monetary tightening, with potentially inflation reduction over the longer term. So, the yield on long term bonds might decline.

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**Q.6)**

- a)
- To increase expected investment returns
  - To reduce risk by diversifying investments geographically and / or across industries
  - To take opportunities in investing industries not available domestically
  - Match overseas liabilities (though this is not likely to be the case for most of the individuals)

**b)****i) Advantages**

- provides a platform to individual investors who want to invest in overseas instruments but lack knowledge about global markets
- provides diversification across different markets and industries as most individuals can't afford to obtain, or may not have access to, a broad spread of direct investments
- relatively easy to invest and sell
- appropriate for investment of small amounts
- possible tax advantages

**Disadvantages**

- the asset mix is not within the control of the individual investor and not always appropriate
- expense levels could be relatively higher

- ii) Advantages are similar to those in b (i) above. Further, the company is listed locally and hence easy to deal.

**Disadvantages:**

- investment is still basically in a domestic company and its share price is likely to be impacted by local stock market conditions
- company still has extensive domestic interests
- investor has much less control over the nature of overseas exposure
- the company's business model can change and share of exports can increase or reduce
- company may not be able to offset all withholding taxes

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**Q.7)**

- a)
- A recently started company will need capital to support operational and capital expenses
  - To fund new business strain created by new sales
  - To meet regulatory capital requirements
  - Demonstrate better financial strength as this could be important to attract new

- third party distributors or get better credit rating
  - Cushion against uncertain future events (e.g. mortality, morbidity, guarantee and persistency risks)
  - To achieve strategic aims (e.g. develop a new sales channel; develop new product line; acquire a new company)
  - Increase free reserve so as to invest more freely
- b)**
- Reinsurance helps limit exposure to risk
    - In term insurance, critical illness insurance and group life insurance the amount of claim is known in advance but the timing is not
    - There is a risk that the assumptions made on mortality and critical illness incidence could be wrong and actual claims higher than expected
    - This is particularly so in critical illness where the company is unlikely to have good past data
    - Reinsurance will reduce the financial effect arising out of volatility around these risks
    - Products like group life insurance also exposes the company to concentration risk (example, many deaths from fire on an oil rig)
    - Reinsuring these risks thus avoids nasty surprises in financial statements because of claims volatility
      - which is quite important for a small and rapidly growing company
  - Reinsurers provide support through their expertise
    - Which is again valuable to a small and growing company
    - Areas of such support include underwriting, product design (new risks, unusual risks), developing new channels or expanding into new territories
  - Increasing capacity to accept risk by sharing risk on large cases or substandard cases
    - We on our own might not have the risk appetite to write such cases
  - Reinsurance can also provide financial assistance
    - Help reduce new business strain
    - Bolstering free assets
  - Reinsurance can thus be viewed as insuring some of our insurance risks
    - For which we have to pay premiums to the reinsurer
    - It is not appropriate to view efficiency of reinsurance only on the basis of premiums paid to reinsurer and claim benefits received from them as it ignores
      - expertise, peace of mind (by sharing risks) and our ability to write large / unusual risks provided by reinsurers
      - the overall value added to the balance sheet as regulators normally allow
        - credit for reinsurance in policy reserves
        - credit for reinsurance in calculation of regulatory solvency thereby reducing regulatory capital requirements.
- c)**
- Financial Reinsurance (known as FinRe) involves less of transfer of risk and is motivated more by financial objectives.

- The main aim is to exploit some form of regulatory arbitrage in order to more efficiently manage the capital, solvency or tax position of a life insurance company.
- However, financial reinsurance is not always viewed favourably by regulators and therefore legislation might limit its use.
- Financial reinsurance usually operates either by:
  - Increasing the assets without a corresponding increase in the liabilities
    - Reinsurer provides a loan to the company but the repayment of the loan is contingent upon the stream of future profits being generated by the business.
    - The block of business being reinsured could be new or existing business.
    - As the loan repayment is contingent the insurance company need not include a provision for repayment in its balance sheet.
    - Another way is for the loan to be received as reinsurance commission for every block of new business and repaid as part of reinsurance premiums. The reinsurer then takes the lapse risk associated with the repayments.
  - reducing the liabilities without a corresponding reduction in the assets
    - one way in which this could be achieved would be through using assets that are not admissible for supervisory solvency purposes as a reinsurance premium
    - the liabilities are then reduced by the amount of reinsurance but the supervisory value of the assets is unchanged as the reinsurance premium paid had no value for supervisory purposes.

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Q.8)

a)

i)

- The main objective of the investment strategy would be to meet liabilities as they fall due.
- The investment policy may impact the reputation of the charity, which will have broad objectives and constraints.
- The investment strategy will need to consider the following aspects of its liabilities
  - The nature of liabilities – the education expenses are unlikely to be fixed and could increase in line with inflation; the charity would also have to incur expenses in maintaining its office and paying salaries to its staff.
  - The currency of the liabilities would appear to be in local currency unless some of the children are sent for overseas education
  - Term of liabilities could be longer if the charity is funding the education expenses of a child until the child graduates from university.
  - The level of uncertainty of existing liabilities both in terms of amount and timing
  - Future accrual of liabilities
- The charity should also consider the following tax aspects
  - Its own tax position
  - Tax treatment of different investments

- Other issues that need to be considered
  - The extent of risk it is willing to take on its investments
  - It is likely that as a charity, the institution could be subject to statutory or legal limitations on the types of investments it could make.
  - Further, the charity could have its own internal norms on allowed asset classes (e.g. ethical investments)
  - Any benchmark return expected by the charity and any upper limits on portfolio turnover (i.e. switching between investments)
  - The size of assets, both in relation to liabilities and absolute terms (this would be a factor in deciding on investing directly or via collective investment vehicles and also in diversification across asset classes)
  - Existing assets
  - Amount and timing of contribution incomes
  - Liquidity requirements (i.e. cash needed for short term outgoings)
  - Expected return from various asset classes, risks and expenses associated with such assets
  
- ii) Fund needs to generate enough return each year to pay annual outgos on funding and expenses =>income important, can they distribute capital profits and can it distribute assets to meet revenue shortfalls?  
 [maximum for (a) 9 marks – marks awarded irrespective of whether answering (i) or (ii) provided they are in correct context]

**b)**

- i)
  - Counterparty risk
    - which includes settlement risk
  - Liquidity risk
  - Concentration risk
  
- ii) Risk could be reduced by
  - Not purchasing subordinated debt
  - Ensuring that there are restrictions on further corporate borrowing
  - Ensuring that the bond purchased is secured on fixed assets
  - If not secured with fixed charges, then a floating charge is preferable to unsecured debt
  - Ensuring that the issuer has a given credit rating, e.g. investment grade or above
  - Carefully monitoring income / capital cover ratios to avoid holding onto a bond with increasing or unacceptable levels of default risk
  - Obtaining parent company guarantees if the bond is issued by a subsidiary
  - Obtaining insurance e.g against credit risk
  - Not holding too much of this particular corporate bond, ie by diversifying to reduce concentration risk
  
- c)
  - To meet known short term commitments
  - Possibly some of the liabilities are uncertain and hence need to hold some liquid assets
  - In order to take part in attractive investment opportunities that may arise from time to time



- Could have received large positive cashflows just before the date of the investment report
- Investment policy is risk averse and hence holding large proportion of cash investments to maintain the monetary value
- Economic circumstances could have made the outlook for other investment categories pessimistic thus making cash attractive. These could include expectations of
  - rising interest rates (which might cause other asset values to fall)
  - economic recession (with a fear that equity and possibly bond prices will fall)
  - the domestic currency to weaken (which makes overseas cash holdings attractive)
  - general economic uncertainty.

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**Q.9)**

- a)
- The discount rate, ie an investor's required return, is given by  
Required return = required risk free real rate of return + expected future inflation + risk premium
  - The risk premium here is the property risk premium required to compensate for the level of risk on this particular investment (leasehold office property) as reflected in
    - Low marketability
    - Possibly large size units and indivisibility
    - Higher dealing and management costs
    - Risk of defaults and voids
- b)
- Next rent review is due in one year's time at which time the current rent of Rs. 10 mn would still be higher than the rack rent (Rs 9 mn inflated at 3% per annum).
  - The value of the leasehold, V, is the sum of
    - 2.5 mn payable in advance for 16 quarters
    - 2.5324 mn payable in advance for 12 quarters thereafter
    - 2.7672 mn payable in advance for 12 quarters thereafter
    - 3.0238 mn payable in advance for 12 quarters thereafter
 All discounted at an interest rate of  $i$ , where 2.4114%
  - In the above equation, Rs. 2.5324 mn is the quarterly rent payable for three years after four years from now, derived as Rs. 9 mn inflated at 3% per annum for four years. Likewise, the rent is inflated at rent reviews after 7 and 10 years from now
  - The discount rate of 2.4114% per quarter is the equivalent of 10% per annum.
  - $V = \text{Rs. } 79.2352 \text{ mn}$
  - The following are ignored
    - expenses involved in rent review and rent collection
    - possible defaults and resulting voids
    - tax
    - ground rent, if any
- c)
- The buildings revert to the freeholder at the expiry of the lease and could have some residual value.

- Different approaches are possible for assessing the value, for example
  - Estimate a sale price at the end of the term of the lease
  - Assume that new leases of same form are set up
- The buildings may deteriorate over time and may need some modernization at the end of the term of the lease. There could thus be costs of refurbishment.
- There may be problems at the reversion if the property or the site has been polluted or is in an environmentally unacceptable state.

[12]

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