Actuarial Society of India
EXAMINATIONS

08th November 2006

Subject ST5 – Finance and Investment A

Time allowed: Three Hours (10.15* - 1.30 pm)

INSTRUCTIONS TO THE CANDIDATE

1. *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.*
2. *You must not start writing your answers until instructed to do so by the supervisor.*
3. *The answers are not expected to be any country or jurisdiction specific. However, if examples/illustrations are required for any answer, the country or jurisdiction from which they are drawn should be mentioned.*
4. *Mark allocations are shown in brackets.*
5. *Attempt all questions, beginning your answer to each question on a separate sheet.*
6. *Fasten your answer sheets together in numerical order of questions. This, you may complete immediately after expiry of the examination time.*

<u>**Professional Conduct:**</u>

"It is brought to your notice that in accordance with provisions contained in the Professional Conduct Standards, If any candidate is found copying or involved in any other form of malpractice, during or in connection with the examination, Disciplinary action will be taken against the candidate which may include expulsion or suspension from the membership of ASI."

Candidates are advised that a reasonable standard of handwriting legibility is expected by the examiners and that candidates may be penalized if undue effort is required by the examiners to interpret scripts.

AT THE END OF THE EXAMINATION
Hand in BOTH your answer script and this question paper to the supervisor.

Q.1) Country X is a large industrialized nation with a mature stock exchange whereas Country Y large developing economy with a relatively small and underdeveloped stock exchange and capital market.

The Governments of both countries have decided to undertake a full review of their regulatory regimes for their securities and investment management industries.
For each country, discuss the considerations that need to be borne in mind and the most suitable type of regulatory regime **[6]**

Q.2) Define and describe the beta of an equity portfolio and give two examples, including formulae of risk adjusted return measures that make use of the beta of a portfolio. **[6]**

Q.3)
(i) Briefly describe the classical and imputation system of corporate tax. (4)

(ii) Outline the considerations that investors need to consider regarding the taxation system when deciding on their most appropriate investment strategy (2)
[6]

Q.4)
(i) Outline the main investment characteristics of a direct venture capital investment in a new company. (3)
(ii) State with reasons whether this investment would be suitable for a typical defined pension scheme (3)
[6]

Q.5)
(i) List 4 economic factors which influence the level of government bond yields (2)

(ii) Discuss additional features that lead to different yields being available on corporate bonds and equities (2)

(iii) Comment on how the real yield premium on equities over government and corporate bonds might be expected to move over a period of recession in the economy (2)
[6]

Q.6) A retired couple in their 60's own their own home. They plan to sell their home to their daughter on the basis they can continue to live in the home rent-free until they die.
(i) List the factors you would take into account when calculating the price the daughter should offer for buying the home. (6)
(ii) State with reasons other factors relevant to the daughter's considerations of this investment (4)
[10]

Q.7)

(i) Show that an interest rate floor can be viewed as a portfolio of call options on Zero Coupon bonds. Define all symbols used   (5)

(ii) An institutional investor has purchased a five year quarterly interest rate floor based on three month LIBOR with the floor interest rate set at 5.10% pa compounded quarterly on a principal of USD 100 million. The spot LIBOR rates for terms ranging between 3 months to 12 months are as follows:

Term (in months)	Continuously Compounded Spot Rates
3	4.81% pa
6	4.82% pa
9	4.85% pa
12	4.87% pa

The spot rate volatility parameter is 10% pa

(a) In the context of interest rate floors, distinguish between flat and spot volatilities   (2)

(b) Based on the above data calculate the value of a floorlet whose payment is due at the end of the first year. State assumptions, if any   (6)

[13]

Q.8) A company has issued a Zero coupon bond that is due to be repaid in T years' time at face value F. The value of this company at time t is V_t. Let $?_T$ denote the magnitude of any default that might occur at time T on the bond; and let $?_t$ denote the value at time t of any possible default. You can assume that V_t follows Geometric Brownian motion with volatility parameter $?$.

(a) Show that $?_T = \text{Max}(F - V_T, 0)$ (2)

(b) Write down a formula for $?_t$ (2)

(c) You have been informed that the company has issued Zero Coupon bonds with a face value of Rs. 460 million with a remaining life of 5 years. The value of the company's underlying assets is currently Rs. 1150 million and has a volatility parameter of 20% pa. The continuously compounded risk free rate of interest is 6% pa.

(i) Calculate the current value of the Zero Coupon bond allowing for the possibility of default. State assumptions, if any.   (5)

(ii) Assume that the current value of the company drops by 2%. Estimate the approximate change in the value of the bond.   (1)

[10]

Q.9)

(a) Derive the formula for the optimal hedge ratio (minimum variance hedge ratio) involving a futures contract. Define the symbols used.   (4)

(b) A fund manager has a portfolio worth USD 50 million with a beta of 0.87. The manager is concerned about the performance of the market over the next two months and plans to use a three month futures contract on the S & P 500 to hedge the risk. The current level of the index is 1250, one contract is on 250 times the index, the risk free rate is 6% pa and the dividend yield on the index is 3% pa.

(i) Calculate the theoretical price for the three month futures contract. (1)

(ii) What position should the fund manager take to eliminate all exposure to the market over the next two months? (2)

[7]

Q.10)

(a) Briefly discuss the drawbacks of using a deterministic investment model for testing the suitability of a given asset distribution. (5)

(b) A portfolio manager believes that the market's expectation on inflation is far too low. She manages an investment portfolio that is entirely invested in long dated conventional gilts. Set out the alternative courses of action which the portfolio manager can take to alter the portfolio to be more consistent with her views (4)

(c) The actuary of XYZ Pension Fund has recently completed an Asset/Liability study of the fund. This study revealed that 80% of the fund's liabilities are linked to salary inflation and 20% are fixed in nominal terms. The actuary has therefore recommended that the following liability benchmark portfolio would be suitable for matching purposes:
   - 60% in domestic equities
   - 20% in domestic property
   - 20% in fixed interest undated bonds

Based on this recommendation, the trustees have set up a strategic benchmark portfolio consisting of
   - 85% in domestic equities
   - 15% in domestic fixed interest government bonds.

The trustees have chosen two specialist managers to manage the fund: a domestic equity manager whose style is described as "growth" and a passive bond manager who aims to match a 10 year government bond index. Briefly discuss the risks inherent in the portfolio construction of this pension fund. State underlying assumptions, if any.

(4)

[13]

Q.11)

(a) Companies A and B faces the following interest rates (adjusted for the differential impact of taxes:

	A	B
US dollars (floating rate)	LIBOR + 0.5%	LIBOR + 1.0%
Canadian dollars (fixed rate)	5.0%	6.5%

Assume that A wants to borrow U.S. dollars at a floating rate of interest and B wants to borrow Canadian dollars at a fixed rate of interest. A financial institution is planning to arrange a swap and requires a 50 basis point spread. Design a swap that will net the financial institution 50BP pa and will appear equally attractive to companies A and B.   (5)

(b) Explain why a bank is subject to credit risk when it enters two offsetting interest rate swaps.   (2)

(c) A bank has entered into an interest rate swap with company X. Under the terms of the swap it receives 10% pa and pays six month LIBOR on a principal of
USD 10 million for five years. Payments are made every six months. Suppose company X defaults on the sixth payment date (end of year 3) when the interest rate (with semi annual compounding) is 8% pa for all maturities.
Calculate the loss to the bank. Assume that six month LIBOR was 9% pa halfway through year 3. State other assumptions, if any   (4)

[11]

Q.12)   The following data have been provided to you by the trustees of a pension fund:

Year	2004	2005
A. Actual Asset Allocation:		
(i) Equities	50%	60%
(ii) Bonds	50%	40%
B. Benchmark Asset Allocation:		
(i) Equities Index	60%	40%
(ii) Bonds Index	40%	60%
C. Investment Returns:		
(i) Average Return for Similar Funds	7.0%	8.0%
(ii) Equity Index Return	10.0%	12.5%
(iii) Bond Index Return	5.5%	4.5%
(iv) Equity Return in Fund	9.5%	14.5%
(v) Bond Return in Fund	6.0%	5.5%

(a) List the three methods used to assess portfolio performance   (1)

(b) Evaluate and comment on the past performance of the fund as a whole over the two year period using the three different methods. State assumptions, if any.   (5)

[6]

****