INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

26 September 2011 (am)

Subject CA1 — Actuarial Risk Management

Paper One

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*

2. *You have 15 minutes before 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.*

3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*

4. *Mark allocations are shown in brackets.*

5. *Attempt all seven questions, beginning your answer to each question on a separate sheet.*

6. *Candidates should show calculations where this is appropriate.*

AT THE END OF THE EXAMINATION

Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator from the approved list.

1 Describe the tools that can be used to aid risk management over the life cycle of a general insurance product. [8]

2 A national government is concerned about the number of women without adequate pension provision

Outline the actions the government could take to encourage additional pension provision for women. [9]

3 An individual has won a sum of money equal to three times his net annual salary. He has a mortgage that is due to be paid off over the next ten years. He has decided to invest in various types of asset classes with the aim of paying off the mortgage within five years, ideally leaving him with surplus funds.

(i) Explain by setting out a suitable formula how he could use portfolio theory to assess the best way to maximise the surplus. [6]

(ii) Discuss the factors the individual would consider in choosing the asset classes to invest in. [3]
[Total 9]

4 (i) Describe how an insurance company could allow for uncertainty when establishing prudent provisions for the liabilities in respect of the cashflows from a block of annuity business. [5]

(ii) Discuss how this approach could be adapted when establishing prudent provisions for the following:

(a) A reported claim on a professional indemnity insurance policy.

(b) A group of insurance companies who are insuring a space shuttle on a short mission.

(c) A new class of marine insurance written by a general insurance company.

(d) A large, mature portfolio of extended warranty guarantees covering digital televisions.

[8]
[Total 13]

5 (i) Describe the different types of collective investment vehicles. [5]

An investor is comparing the performance of a unit trust to that of an investment trust, both of which invest in real property.

(ii) Explain why the performance of the two trusts over the same time period may differ. [9]

A company issues securities known as "auction securities":

- An auction security is a long-term conventional bond that is subject to an auction every three months.
- When the security is issued, the issuing company specifies the term of the security (typically 5–10 years) and the maximum coupon rate.
- The purpose of the auction is to agree the coupon to be paid for the next three months, subject to the maximum coupon rate.
- The auction works by investors bidding a coupon rate they would be willing to receive on the security and the amount of stock they would accept.
- The agreed coupon rate is the lowest rate needed to fully allocate the security, and the security is then allocated to investors who bid at that rate (or lower).
- If existing holders of the security had bid higher than the agreed coupon rate (and so are not allocated stock), then their capital is repaid at par value by the new investors who bid lower and have been allocated stock.
- If there are not sufficient investors to fully allocate the security, then the existing holders will continue to hold the security and will receive the specified maximum coupon rate.
- New investors wishing to buy the security will bid for a low coupon, and existing investors who want to sell the security will bid for a high coupon.
- Security-holders can sell stock at any time, provided they can find a buyer.

(iii) Describe the principal investment characteristics and risks of the auction securities, for both the company and investors. [8]

[Total 22]

6 In three years' time, a small provincial town will be celebrating the 750th anniversary of its founding. The organising committee is planning large and expensive celebrations to be held over a weekend during the anniversary year. The committee is worried about the festivities being disrupted or ruined by bad weather.

The part of the country where the town is situated has notoriously unpredictable weather that can cover the full range of possible conditions from mild to extreme.

Data exists covering local, regional and national weather records over the last few centuries. However, the more local the data is, the less complete and accurate it is.

A senior lecturer at the town's college is proposing to use this data in a model that will predict the best date for this event.

(i) Suggest the criteria that could be used to assess whether the weather on a particular weekend is likely to disrupt or ruin the event. [3]

(ii) Discuss the extent to which the available data may be appropriate for the prediction model. [9]

(iii) Outline other considerations that could influence the committee's choice of the date for the celebratory weekend. [2]

(iv) Set out the difficulties that the committee could face if it tried to fully transfer its financial risks on this project to a third party. [4]

[Total 18]

7 (i) State the reasons for monitoring experience. [3]

An insurance company took over the liabilities for pensioners of a manufacturer's defined benefit scheme three years ago. The manufacturer is based in three locations in different regions of a country. The insurer has carried out an analysis of this contract and the results show that the contract generated a profit for the insurer after the three years. The main reason emerging from the analysis is that the mortality experience was heavier than expected.

(ii) Describe how the insurer analysed the mortality experience of the contract over the three-year period [8]

(iii) Suggest other possible reasons why the insurer made a profit on this contract over the three years [4]

The insurer is looking at taking over pensioner liabilities of a number of other companies' defined benefit schemes. The marketing director has indicated that the mortality basis for pricing future contracts should be changed to reflect the heavier mortality experienced by the contract won three years ago.

(iv) Comment on this suggestion [6]

[Total 21]

END OF PAPER