

# INSTITUTE AND FACULTY OF ACTUARIES



## EXAMINATION

25 September 2017 (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 must not start writing your answers in the booklet until instructed to do so by the supervisor.*
3. *You have 15 minutes of planning and reading time before the start of this examination. You may make separate notes or write on the exam paper but not in your answer booklet. Calculators are not to be used during the reading time. You will then have three hours to complete the paper.*
4. *Mark allocations are shown in brackets.*
5. *Attempt all seven questions, beginning your answer to each question on a new page.*
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** An insurance company sells policies which aim to cover long-term care costs for people once they are unable to look after themselves in their own homes.

The insurance company operates in a developed economy which is experiencing reduced government spending following a recession. Demand for these long-term care policies has increased significantly in the years since the recession started.

Discuss which external environment factors may have contributed towards this increase in demand. [7]

- 2** Conglomerate Group is a company which has grown by acquiring a number of businesses as subsidiaries which operate as independent business units within Conglomerate Group. Each subsidiary has its own management team and manages its own risks.

The directors of Conglomerate Group believe this approach to be the most appropriate for controlling the risks inherent in the company's overall operations.

A major shareholder of Conglomerate Group is concerned about this approach. They have suggested that an enterprise wide risk management system as the best way to control the company's risks.

- (a) Discuss reasons why the shareholder might be concerned about the current approach adopted by the company.
- (b) Comment on the shareholder's suggestion with reference to the concerns identified in (a). [7]

- 3** (i) List six areas of actuarial work where data would be required. [3]
- (ii) Describe how actuaries can mitigate or make allowances for the problems that may arise from poor quality data. [8]

[Total 11]

- 4 (i) Outline the principal reason why groups of individuals may wish to pool risk events that they are exposed to. [2]
- (ii) State the ideal criteria to be met before an insurance company would be willing to provide insurance protection for risk events. [3]

The government of a developed country is increasing its use of nuclear power plants. These plants are owned and operated directly by the government. The government's objective is that nuclear power plants will provide a significant proportion of the country's energy needs.

The government is considering possible ways of covering the potential costs arising from incidents at its nuclear plants.

- (iii) Discuss how effective insurance or other risk pooling approaches might be in covering these costs. [6]
- [Total 11]

- 5 The climate of a country has been changing with flooding increasing in frequency and severity across many regions.

During the same period premiums for the average household insurance cover have risen considerably and the range of premiums by region and within regions has widened significantly.

- (i) Describe why the change in climate could have caused such a change to the distribution of market premiums. [4]

The government of the country is concerned that household insurance cover is now becoming unaffordable for many people especially in high risk areas.

- (ii) Explain the reasons why the government is concerned about the unaffordability of household insurance cover. [3]

The government is proposing two possible proposals to make household insurance cover more affordable:

- Provide direct government subsidies to certain households to be used towards the cost of household insurance cover.
- Introduce a cap on the premium insurance companies charge for household insurance cover.

- (iii) Discuss how effective the proposals could be in addressing the government's concerns. [4]

- (iv) Discuss other potentially significant consequences for the household insurance market. [4]

[Total 15]

- 6 There has been a distinctive pattern to mortality rates by age in a country for many years.

Male mortality rates from ages five to seventeen are low and similar. Thereafter, they rise steeply, peaking at age twenty five. They then fall steadily to age thirty where the mortality rate is similar to that at age nineteen.

Female mortality rates from ages five to thirty are lower than male rates and generally rise steadily with age without the peak at age 25 prevalent in male mortality rates.

- (i) Discuss why the mortality rates between genders described above might vary so significantly. [5]

Recent anecdotal mortality evidence from the last three years appears to imply that female mortality rates are changing and now show a similar pattern to male mortality rates from ages seventeen to thirty.

- (ii) Outline why it may be inappropriate for the providers of death benefits to change the assumptions they use for female mortality rates in the light of this evidence. [5]

Subsequently, detailed investigations have shown that male mortality rates have not changed significantly, but female mortality rates from ages seventeen to thirty are moving closer to male mortality rates.

- (iii) Discuss the possible implications of this change in female mortality rates for:
- (a) the premium charged by a motor insurance company.
  - (b) the premium charged by an insurance company that writes term assurance policies used in conjunction with mortgage loans.
  - (c) the pension contributions required from a retailer of women's clothes which provides pension and death benefits for its employees through a defined benefit pension scheme.

[8]

[Total 18]

7 A professional orchestra that performs classical music concerts in a few locations around one city is about to undertake its first international tour. The objective of the tour is to raise the profile of the orchestra and generate income both now and into the future.

Over three weeks there will be a twelve concert tour across six different countries. There are about 150 people of many different nationalities in the tour entourage including musicians and support staff.

- (i) Outline the additional or extensions to existing insurance cover the orchestra might need for the tour over and above the cover it has in place for its regular domestic activities. [5]
- (ii) Discuss the factors the managers of the orchestra should consider when deciding whether to purchase additional insurance cover or to retain the additional risks. [6]

The tour director has asked an actuary to model its future cashflows to assess the tour's profitability and/or likelihood of achieving its objectives.

- (iii) State the basic features of general actuarial models that are used to project future cash flows.

*You do not need to cover the steps or requirements for actually using or building a model.* [5]

- (iv) Describe the cash flows relating to this tour that would need to be allowed for by a model that aims to assess the tour's profitability. [10]

- (v) Set out how sensitivity analysis would be used in conjunction with modelling the cash flows described in (iv). [5]

[Total 31]

**END OF PAPER**