EXAMINATION

15 April 2008 (pm)

Subject ST1 — Health and Care Specialist Technical

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 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.*

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 7 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 (i) Explain why it is often necessary to exclude explicitly certain causes of disability (or "perils") from the cover of healthcare insurance contracts. [4]

(ii) List eight common exclusions associated with healthcare insurance. [2]
[Total 6]

2 (i) Outline the approaches taken under the two methods commonly used for calculating option charges or premiums. [2]

(ii) Compare the relative merits of each method. [2]

A ten year insurance with sum assured of S payable at the end of the year of death or critical illness event has an option to extend the term for another ten years at expiry. The premium payable in the extended period will be the then in force standard rate.

(iii) Set out, under each of the two methods in common use, the formula to evaluate the option premium, defining all the terms used. [6]
[Total 10]

3 The country of Actuaria has recently introduced individual capital adequacy standards for companies writing insurance business in Actuaria. Under the new rules, insurance companies are required to hold capital for market risk, default risk, insurance risk, persistency risk and operational risk. The capital requirement for each risk has to be individually assessed. These individual capital requirements will then be aggregated to form the total capital requirement for the company. In aggregating the capital requirement of these risks, companies are allowed to take credit for diversification benefits.

It has been decided that the diversification benefits will be included using the square root of the sum of the squares approach. If all the individual risks are fully correlated, the total capital requirement will be the sum of all the individual capital requirements. If all the individual risks are fully independent of each other, the total capital requirement will be the square root of the sum of the squares of all the individual capital requirements.

You are the actuary of a healthcare insurance company in Actuaria. You have calculated the following amount of capital requirements for each individual risk.

Market risk:	= £1.5m	(Risk 1)
Default risk:	= £2.0m	(Risk 2)
Insurance risk:	= £5.0m	(Risk 3)
Persistency risk:	= £1.0m	(Risk 4)
Operational risk:	= £3.0m	(Risk 5)

(i) Based on the above individual capital requirements, calculate the maximum and the minimum amount of total capital that your company would have to hold. [1]

The total capital requirement allowing for diversification benefit could be calculated by using a correlation matrix.

	Risk 1	*Risk 2*	*Risk 3*	*Risk 4*	*Risk 5*
Risk 1	C (1,1)	C (1,2)	C (1,3)	C (1,4)	C (1,5)
Risk 2	C (2,1)	C (2,2)	C (2,3)	C (2,4)	C (2,5)
Risk 3	C (3,1)	C (3,2)	C (3,3)	C (3,4)	C (3,5)
Risk 4	C (4,1)	C (4,2)	C (4,3)	C (4,4)	C (4,5)
Risk 5	C (5,1)	C (5,2)	C (5,3)	C (5,4)	C (5,5)

The total capital requirement is calculated as:

$$\sqrt{\sum_i \sum_j (R_i * C_{ij} * R_j)}$$

where:

R_i is the individual capital requirement of risk *i* and
C_{ij} is the correlation between risk *i* and risk *j*, with
C_{ij} =1 being risk *i* is fully correlated with risk *j* and
C_{ij} = 0 being risk *i* is fully independent of risk *j*.

(ii) Complete the above table assuming that:

(a) all the risk are fully independent of each other
(b) all the risks are fully correlated

[4]

Realising that individual risks are unlikely to be fully independent nor fully correlated, your risk management team has derived the following table showing the correlations of each individual risk.

	Market	*Default*	*Insurance*	*Persistency*	*Operational*
Market	1	0.25	0.25	0.25	0.25
Default	0.25	1	0.3	0	0.3
Insurance	0.25	0.3	1	0.25	0.25
Persistency	0.25	0	0.25	1	0.5
Operational	0.25	0.3	0.25	0.5	1

(iii) Calculate the total capital requirement allowing for the appropriate diversification benefits, using the above individual capital requirements and the correlation matrix. [6]

(iv) List other means that the regulator might use to constrain a healthcare provider for the purpose of risk mitigation in addition to the requirement of holding risk capital. [8]

[Total 19]

4 You are the actuary responsible for a small amount of private medical insurance business written on an indemnity basis as short term business. For the current valuation it has been decided that your experienced claims manager will set the outstanding claims reserves on a case-by-case basis.

(i) Describe the main factors that you would expect to be taken into account in setting the outstanding claims reserve for reported claims. [6]

(ii) In addition to the outstanding claims reserve, list ten additional reserves that you might need to consider for PMI business. [5]

(iii) Outline the other factors which should be allowed for explicitly when assessing possible future claims when setting reserves. [4]
[Total 15]

5 You are the marketing actuary for the health and care area of an insurance company. Your marketing manager has noted that some insurers rate their immediate annuities by age, sex and according to the geographical location where the policyholder lives (postal code rating).

The marketing manager is suggesting that this approach could be applied to rating immediate care annuities that are currently underwritten on a case-by-case basis.

Discuss the effect of using this revised approach from the point of view of:

(i) the prospective policyholder [2]
(ii) the insurance company [4]

Having discussed this with the pricing actuary, the marketing manager has suggested the following approaches to allow for the higher mortality rates for impaired life immediate annuitants in comparison with those assumed for standard life immediate annuitants:

Option A: multiple of the mortality rates of standard life immediate annuitants

Option B: constant addition to the mortality rates of standard life immediate annuitants

Option C: decreasing additional mortality loading on the mortality rates of standard life immediate annuitants

(iii) Discuss the appropriateness of each of the above approaches and suggest two medical conditions that might be appropriate for each approach. [7]
[Total 13]

6 (i) Outline the main clauses of a reinsurance contract that might be available to cover income protection business. [12]

Company ABC is a small insurer writing income protection (IP) locally. It is being taken over by XYZ, a large bancassurer, that has not sold IP business to date, but intends to market IP internationally in the future. ABC has a reinsurance treaty in place on its IP business.

(ii) Describe briefly the areas in which XYZ might want to change or renegotiate this treaty as a result of the takeover. [2]
[Total 14]

7 You are an actuarial consultant working in the country of Actuaria. In Actuaria, a monthly benefit is provided to individuals who meet the requirements of the state's incapacity tests. These tests are based upon the ability of individuals to perform their own or any suited occupations. The government is considering changing these benefits as follows:

- Individuals who are unable to perform their own occupation will be provided with a monthly benefit of 50% of the existing benefit.
- Individuals who are very severely incapacitated will be provided with a significantly higher benefit.

The government has agreed that the definition of severely incapacitated will be based upon the ability of an individual to perform activities of daily living. The government anticipates that these changes will reduce the amount of money the state pays out on incapacity benefits.

(i) Describe the government's objectives in providing healthcare benefits. [3]

(ii) Discuss how well the proposed changes to healthcare benefits would meet these objectives. [3]

Within Actuaria, there is currently a very successful health insurance market providing income protection and critical illness business. The government has asked you to consider the possible implications of the proposed changes on the health insurance industry.

(iii) Describe the key issues that you would consider in your response. [4]

An insurance company within Actuaria provides only income protection cover and has not changed its premium rates for several years. Its contracts pay out a maximum benefit of salary less any state benefits. The insurance company has realised that the government's proposals will have an impact on the cost of providing income protection benefits, and that if these proposals go ahead it would need to reprice its product.

(iv) Describe the investigations that the company would undertake in order to reprice its product. [13]
[Total 23]

END OF PAPER