

2021 Study Guide

Subject F103

Introduction



This Study Guide contains all the information that you will need before starting to study Subject F103 (previously Subject ST3) for the 2021 exams. **Please read this Study Guide carefully before reading the Course Notes**, even if you have studied for some actuarial exams before.

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1 The Subject F103 course structure

There are six parts to the Subject F103 course. The parts cover related topics although some parts are longer than others. The parts are broken down into chapters.

The following table shows how the parts, the chapters and the syllabus items relate to each other. This table should help you plan your progress across the study session.

Part	Chapter	Title	No of pages	Syllabus objectives
1	0	Introduction to general insurance	39	
	1	Insurance products - background	45	General principles (b)
	2	Insurance products - types	76	General principles (b)
	3	Tackling an unusual product	10	
	4	Accounting methods	51	Reserving and capital modelling (m)
	5	Reinsurance products - background	30	General principles (c)
	6	Reinsurance products - types	55	General principles (c)
	7	Determining appropriate reinsurance	23	Reserving and capital modelling (k)
	8	General insurance markets	33	General principles (d) (e) Reserving and capital modelling (n)
	9	External influences	40	General principles (d)
2	10	Risk and uncertainty	27	General principles (f)
	11	Data	44	General principles (g)
	12	Actuarial investigations	58	General principles (h)
	13	Reasons for reserving and reserving bases	18	Reserving and capital modelling (b)
3	14	Best estimate reserves	61	Reserving and capital modelling (a) (e)
	15	Quantifying uncertainty in reserves	33	Reserving and capital modelling (c) (e)
	16	Assessment of reserving results	27	Reserving and capital modelling (d)
	17	Reinsurance reserving	21	Reserving and capital modelling (l)
4	18	Rating methodologies	51	Pricing (a) (h) (j)
	19	Methods of calculating the risk premium	87	Pricing (c) (d) (e) (f) (g) (i)
	20	Further considerations when rating	27	Pricing (a) (b)
5	21	Investments and ALM	35	Reserving and capital modelling (f)
	22	Capital modelling	81	Reserving and capital modelling (g) (h) (i) (j)
	23	Glossary	46	Pricing (f)

2 The Course and the Profession

The Course consists of Course Notes, the Question and Answer Bank and the Series X Assignments. Collectively, these are referred to as the Combined Materials Pack (CMP).

Course Notes

The Syllabus for Subject F103 has been written by the Actuarial Society of South Africa (ASSA) and states the requirements of the examiners. In doing this, the ASSA has based the Subject F103 syllabus very closely upon the syllabus of the UK Profession's Subjects SP7 and SP8. The relevant individual Syllabus Objectives are included at the start of each course chapter and a complete copy of the Syllabus is included in Section 6 of this Study Guide. We recommend that you use the Syllabus as an important part of your study.

The Subject F103 Course Notes include the majority of the UK Profession's Core Reading from Subjects SP7 and SP8. This Core Reading covers what is needed to pass the UK exams and is equally relevant for Subject F103. The tuition material that has been written by ActEd enhances it by giving examples and further explanation of key points.

Question and Answer Bank

The Question and Answer Bank provides a comprehensive bank of questions (including some past exam questions) with full solutions and comments.

The Question and Answer Bank is divided into six parts. The first five parts of the Question and Answer Bank include a range of short and long questions to test your understanding of the corresponding part of the Course Notes, whilst the last part contains a set of exam-style questions covering the whole course.

Assignments

The five Series X Assignments (X1 to X5) cover the material in Parts 1 to 5 respectively. Each assignment contains at least 80-marks. The actual Subject F103 examination will have a total of 100 marks, to be completed in three hours.

Core Reading accreditation

The Institute and Faculty of Actuaries would like to thank the numerous people who have helped in the development of this material and in the previous versions of Core Reading.

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Legal action will be taken if these terms are infringed. In addition, we may seek to take disciplinary action through the profession or through your employer.

These conditions remain in force after you have finished using the course.

Past exam papers

You can download the past papers and reports for Subject F103 from the Actuarial Society's website at www.actuarialsociety.org.za.

Past papers and reports for UK Subjects SP7 and SP8 (and their predecessors, Subjects ST7 and ST8) are available at www.actuaries.org.uk. These cover similar material to Subject F103.

Recommended reading

The exam will be based on the relevant Syllabus and the Course Notes will be the main source of tuition material for students.

Calculators

Please refer to the profession's website for the latest advice on which calculators are permitted in the exams.

3 Further study support

Queries and feedback

From time to time you may come across something in the study material that is unclear to you. The easiest way to solve such problems is often through discussion with friends, colleagues and peers – they will probably have had similar experiences whilst studying. If there's no-one at work to talk to then use ActEd's discussion forum at www.ActEd.co.uk/forums (or use the link from our home page at www.ActEd.co.uk). You might find the Subject SP7 and SP8 forums useful, along with the forum for students studying in South Africa.

Our online forum is dedicated to actuarial students so that you can get help from fellow students on any aspect of your studies from technical issues to study advice. You could also use it to get ideas for revision or for further reading around the subject that you are studying. ActEd Tutors will visit the site from time to time to ensure that you are not being led astray and we also post other frequently asked questions from students on the forum as they arise.

If you have any comments or concerns about the Syllabus or Course Notes, these can be passed on via ActEd by emailing SP7@bpp.com or SP8@bpp.com. Alternatively, you can send these comments to:

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The ActEd website

The ActEd website at **www.ActEd.co.uk** contains much useful information on all aspects of ActEd's products and services, including:

- copies of the Study Guide in every subject
- the current *Student Brochure* and application forms
- a link to ActEd's online store
- a link to the ActEd discussion forum
- details of any minor corrections to the study material
- advice on study and a blank personal study plan.

4 How to study to pass the exams

The F100 Subject exams

It is important to recognise that the F100 subject exams are very different from the earlier exams in both the nature of the material covered and the skills being examined.

Both the Course Notes and the exam papers themselves are generally less numerical and more “wordy”. The exam will primarily require you to explain a particular point in words and sentences, rather than to manipulate formulae. If you haven’t sat this type of exam for some time, you need to start practising again now. Many students find that it takes time to adjust to the different style of the F100 subject exam questions. As ever, practice is the key to success.

The aim of the exams is to test your ability to apply your knowledge and understanding of the key principles described in the Course to specific situations presented to you in the form of exam questions. Therefore your aim should be to identify and understand the key principles, and then to practise applying them. You will also need a good knowledge of the Course to score well and quickly on any bookwork questions.

We recommend that you prepare for the exam by practising a large number of exam-style questions under exam conditions. This will:

- help you to develop the necessary knowledge and understanding of the key principles described in the Course
- highlight exactly which are the key principles that crop up time and time again in many different contexts and questions
- help you to practise the specific skills that you will need to pass the exam.

There are many sources of exam-style questions. You can use past exam papers, the Question and Answer Bank (which includes many past exam questions) and Assignments.

Overall study plan

We suggest that you develop a realistic study plan, building in time for relaxation and allowing some time for contingencies. Be aware of busy times at work, when you may not be able to take as much study leave as you would like. Once you have set your plan, be determined to stick to it. You don’t have to be too prescriptive at this stage about what precisely you do on each study day. The main thing is to be clear that you will cover all the important activities in an appropriate manner and leave plenty of time for revision and question practice.

Aim to manage your study so as to allow plenty of time for the concepts you meet in this course to “bed down” in your mind. Most successful students will probably aim to complete the course at least a month before the exam, thereby leaving a sufficient amount of time for revision. By finishing the course as quickly as possible, you will have a much clearer view of the big picture. It will also allow you to structure your revision so that you can concentrate on the important and difficult areas of the course.

A sample UK exam study plan is available on our website at:

www.ActEd.co.uk/Html/help_and_advice_study_plans.htm

Study sessions

Only do activities that will increase your chance of passing. Try to avoid including activities for the sake of it and don't spend time reviewing material that you already understand. You will only improve your chances of passing the exam by getting on top of the material that you currently find difficult.

Ideally, each study session should have a specific purpose and be based on a specific task, eg “*Finish reading Chapter 3 and attempt Questions 1.4, 1.7 and 1.12 from the Question and Answer Bank*”, as opposed to a specific amount of time, eg “*Three hours studying the material in Chapter 3*”.

Try to study somewhere quiet and free from distractions (eg a library or a desk at home dedicated to study). Find out when you operate at your peak, and endeavour to study at those times of the day. This might be between 8am and 10am or could be in the evening. Take short breaks during your study to remain focused – it's definitely time for a short break if you find that your brain is tired and that your concentration has started to drift from the information in front of you.

Order of study

We suggest that you work through each of the chapters in turn. To get the maximum benefit from each chapter you should proceed in the following order:

1. Read the Syllabus Objectives. These are set out in the box on page 1 of each chapter.
2. Read the Chapter Summary at the end of each chapter. This will give you a useful overview of the material that you are about to study and help you to appreciate the context of the ideas that you meet.
3. Study the Course Notes in detail, annotating them and possibly making your own notes. Try the self-assessment questions as you come to them. Our suggested solutions are at the end of each chapter. As you study, pay particular attention to the listing of the Syllabus Objectives.
4. Read the Chapter Summary again carefully. If there are any ideas that you can't remember covering in the Course Notes, read the relevant section of the notes again to refresh your memory.

It's a fact that people are more likely to remember something if they review it several times. So, do look over the chapters you have studied so far from time to time. It is useful to re-read the Chapter Summaries or to try the self-assessment questions again a few days after reading the chapter itself.

You may like to attempt some questions from the Question and Answer Bank when you have completed a part of the course. It's a good idea to annotate the questions with details of when you attempted each one. This makes it easier to ensure that you try all of the questions as part of your revision without repeating any that you got right first time.

Once you've read the relevant part of the notes and tried a selection of questions from the Question and Answer Bank, you should attempt the corresponding assignment.

To be really prepared for the exam, you should not only know and understand the Course, but also be aware of what the examiners will expect. Your revision programme should include plenty of question practice so that you are aware of the typical style, content and marking structure of exam questions. You should attempt as many questions as you can from the Question and Answer Bank and past exam papers.

Active study

Here are some techniques that may help you to study actively.

1. Don't believe everything you read! Good students tend to question everything that they read. They will ask "why, how, what for, when?" when confronted with a new concept, and they will apply their own judgement. This contrasts with those who unquestioningly believe what they are told, learn it thoroughly, and reproduce it (unquestioningly?) in response to exam questions.
2. Another useful technique as you read the Course Notes is to think of possible questions that the examiners could ask. This will help you to understand the examiners' point of view and should mean that there are fewer nasty surprises in the exam room! Use the Syllabus to help you make up questions.
3. Annotate your notes with your own ideas and questions. This will make you study more actively and will help when you come to review and revise the material. Do not simply copy out the notes without thinking about the issues.
4. Attempt the questions in the notes as you work through the course. Write down your answer before you refer to the solution.
5. Attempt other questions and assignments on a similar basis, *ie* write down your answer before looking at the solution provided. Attempting the assignments under exam conditions has some particular benefits:
 - It forces you to think and act in a way that is similar to how you will behave in the exam.
 - The knowledge that you are going to do an assignment under exam conditions can act as a powerful incentive to make you study each part as well as possible.
 - It is also quicker than trying to write perfect answers.
6. Sit a mock exam four to six weeks before the real exam to identify your weaknesses and work to improve them. You could use the Subject SP7 and SP8 mock exams written by ActEd or a past exam paper.

5 ***Frequently asked questions***

Q: *What knowledge of earlier subjects should I have?*

A: The Course Notes have been written assuming that you have already studied, or been exempted from, Subjects A111 – A214. The key topics that you will need to understand when studying Subject F103 are covered in Subjects A111, A212 and A214. (The relevant material from these exams was previously examined in Subject A204).

Before attempting Subject F103, you also need to have achieved at least an FA in, or been exempted from, Subject A311.

Q: *What is your advice if I am simultaneously studying Subject F203?*

A: Subject F203 builds on the principles developed in Subject F103, but requires a much greater depth of knowledge and understanding. Consequently, there is some overlap between the subjects, particularly in the types of questions that are likely to appear on the exam papers. It is therefore important to assimilate the key ideas presented in Subject F103 before tackling the same ground in Subject F203.

We suggest that you aim to cover the Subject F103 course as quickly as possible, so as to get a general feel for the principles underlying general insurance together with an overview of the course content. It also makes sense to quickly review the relevant Subject F103 material prior to working through each chapter in Subject F203. From time to time over the study session, and particularly at the revision stage, it might also be a good idea to review the Subjects F103 & F203 Course Notes at the same time, along with the Question and Answer Banks. In particular, it is always worth thinking about how each idea or principle is presented in each of Subject F103 and Subject F203 and hence how it might consequently be examined in either exam.

Q: *How have these study materials changed since 2020?*

A: There have been no changes to the Combined Materials Pack (CMP) since 2020.

Q: Are there any tutorials available for F103?

A: The Subject SP8 and Subject SP7 Online Classrooms cover much of the material in Subject F103. They are a valuable add-on to your private study.

At the heart of the Online Classrooms is a comprehensive, easily-searched collection of tutorial units. These are a mix of:

- taught material, helping you to really get to grips with the course content, and
- guided questions, enabling you to learn the most efficient ways to answer questions and avoid common exam pitfalls.

The best way to discover the Online Classrooms is to see them in action. You can watch a sample of the Online Classroom tutorial units on our website at www.ActEd.co.uk.

You should bear in mind however that while there is a close correspondence between the South African and UK course material, Subjects SP7 and SP8 contain some topics that are not covered by the F103 syllabus, and at times refer to UK-specific issues.

Q: Are there any revision products for Subject F103?

A: Subjects SP7 and SP8 in the UK are, when combined, broadly equivalent to Subject F103, so we provide details of relevant revision products for these subjects below. Bear in mind however that while there is a close correspondence between the South African and UK course material, Subjects SP7 and SP8 contain some topics that are not covered by the F103 syllabus, and at times refers to UK-specific issues.

Subject SP7 / SP8 Mock Exams

Both of these 100-mark mock exam papers are available for students as a realistic test of their exam preparation.

Subject SP7 / SP8 Additional Mock Packs (AMP)

The Additional Mock Pack (AMP) consists of two further 100-mark mock exam papers. These are ideal if you are retaking and have already sat the Mock Exam, or if you just want some extra question practice.

Subject SP7 / SP8 ActEd Solutions with Exam Technique (ASET)

The ActEd Solutions with Exam Technique (ASET) contains ActEd's solutions to exams in 2014–2017 and 2019–2020, plus comment and explanation. In particular, it will highlight how questions might have been analysed and interpreted so as to produce a good solution with a wide range of relevant points. This will be valuable in approaching questions in subsequent examinations.

Subject SP7 / SP8 Flashcards

Flashcards are a set of A6-sized cards that cover the key points of the subject that most students want to commit to memory. Each flashcard has questions on one side and the answers on the reverse. We recommend that you use the cards actively and test yourself as you go.

Flashcards may be used to complement your other study and revision materials. They are not a substitute for question practice but they should help you learn the essential material required.

Subject SP7 / SP8 Revision Notes

ActEd's Revision Notes have been designed with input from students to help you revise efficiently. They are suitable for first-time sitters who have worked through the ActEd Course Notes or for retakers (who should find them much more useful and challenging than simply reading through the course again).

The Revision Notes are a set of A5 booklets – perfect for revising on the train or tube to work. Each booklet covers one main theme or a set of related topics from the course and includes:

- Core Reading with a set of integrated short questions to develop your bookwork knowledge
- relevant past exam questions with concise solutions from the last ten years
- detailed analysis of key past exam questions (selected for their difficulty), and
- other useful revision aids.

Q: ***What calculators am I allowed to use in the exam?***

A: Please refer to the profession's website for the latest advice.

6 **Syllabus**

The full Syllabus for Subject F103 is given here. To the right of each objective are the chapter numbers in which the objective is covered in the ActEd course.

Aim

The aim of the General Insurance Principles subject is to instil in successful candidates the ability to apply, in simple reserving, capital modelling and pricing situations, the mathematical and economic techniques and principles of actuarial planning and control needed for the operation on sound financial lines of general insurers.

The objectives have been split into three main sections, namely:

- General Principles
- Reserving and Capital Modelling
- Pricing

Links to other subjects

Subject A111 (CS1) – Actuarial statistics: provides a basic grounding in statistics.

Subject A212 (CS2) – Risk modelling and survival analysis: covers some of the stochastic models and mathematical methods relevant for general insurance.

Subject A214 (CM2) – Loss reserving and financial engineering: covers some further models relevant to general insurance.

Subject A311 – Actuarial Risk Management: covers the general underlying principles affecting all specialisms.

Subject F203 – General insurance Fellowship Applications: will use the principles of general insurance developed in this subject to develop a deeper understanding of general insurance business and South African practice.

Additional Reading

Statistical and Probabilistic Methods in Actuarial Science by Philip J. Boland (University College Dublin).

Objectives

On completion of this subject the candidate will be able to:

General Principles

- (a) Define the principal terms in use in general insurance *(Glossary)*
- (b) Describe the main types of general insurance product in terms of:
 - (i) the needs of customers
 - (ii) the financial and other risks they pose for the general insurer including their capital requirements and possible effect on solvency. *(Chapters 1 & 2)*
- (c) Describe the main types of general reinsurance products and the purposes for which they may be used. *(Chapters 5 & 6)*
- (d) Describe the implications of the general business environment in terms of:
 - (i) the main features of the general insurance market
 - (ii) the effect of different marketing strategies
 - (iii) the effect of fiscal regimes
 - (iv) the effect of inflation and economic factors
 - (v) the effect of legal, political and social factors
 - (vi) the effect of the climate and environmental factors
 - (vii) the general effect of professional guidance. *(Chapters 8 & 9)*
- (e) Outline the key features of the Lloyd's market. *(Chapter 8)*
- (f) Describe the major areas of risk and uncertainty in general insurance business with respect to reserving, capital modelling and pricing, in particular those that might threaten profitability or solvency. *(Chapter 10)*

- (g) With regard to the use of data in reserving, capital modelling and pricing:
- (i) describe the types of data that are used
 - (ii) describe the main uses of data
 - (iii) describe the requirements for a good information system
 - (iv) outline the possible causes of data errors
 - (v) identify checks that might be used
 - (vi) understand the effects of inadequate data. *(Chapter 11)*
- (h) Outline the major actuarial investigations and analyses of experience undertaken with regard to reserving, capital modelling and pricing for general insurers. *(Chapter 12)*

Reserving and Capital Modelling

- (a) With regard to reserving work using triangulations:
- (i) Understand the range of general issues that can affect reserving work using triangulations.
 - (ii) Gain an appreciation of how to deal with these general issues in reserving work.
 - (iii) Have an understanding of the main triangulation methods in use - namely the chain ladder method, the Bornhuetter-Ferguson method and the Average Cost per Claim method. *(Chapter 14)*
- (b) Develop appropriate reserving bases for general insurance business, having regard to:
- (i) the different reasons for calculating reserves
 - (ii) the assumptions that might be appropriate in each case
 - (iii) the allowance for future inflation
 - (iv) whether or not to discount for investment income
 - (v) the likely sources of uncertainty
 - (vi) communication of the reserving basis. *(Chapter 13)*

- (c)
 - (i) Describe the uses of stochastic reserving methods.
 - (ii) Describe the following types of stochastic reserving methods:
 - (1) analytic methods
 - (2) simulation-based methods.
 - (iii) Describe the Bootstrapping approach to reserving, and the various approaches that may be followed.
 - (iv) Describe the issues, advantages and disadvantages of each of the methods.
 - (v) Describe the approach to aggregating the results of stochastic reserving across multiple lines of business, and discuss methods of correlation.
(Chapter 15)
- (d)
 - (i) Describe the factors an actuary should consider in assessing the reasonableness of the results of a reserving exercise.
 - (ii) Describe typical diagnostics that are commonly used to assess the reasonableness of the results of a reserving exercise.
 - (iii) Describe the factors an actuary should consider in assessing the reasonableness of changes in results of a reserving exercise over time.
 - (iv) Describe how an analysis of experience might be carried out in the context of a reserving exercise.
 - (v) Describe how alternative results of reserving exercises can arise and highlight some of the professional issues in resolving them. *(Chapter 16)*
- (e)
 - (i) Understand what is meant by a “best estimate” reserve.
 - (ii) Describe the following approaches to estimating ranges of reserves:
 - (1) stochastic models
 - (2) scenario tests
 - (3) use of alternative sets of assumptions
 - (iii) Discuss the uses and issues with each of these methods.
 - (iv) Discuss the issues to be considered when communicating reserve ranges and uncertainties.
(Chapters 14 & 15)

- (f) Describe:
- (i) the principles of investment
 - (ii) the asset-liability matching requirements of a general insurer
 - (iii) how projection models might be used to develop an appropriate investment strategy. *(Chapter 21)*
- (g) (i) Understand the following considerations in deriving and applying capital modelling techniques:
- (1) business plans
 - (2) risk registers
 - (3) model requirements.
- (ii) Understand the following approaches to capital modelling:
- (1) deterministic models
 - (2) stochastic models
 - (3) aggregation methodologies
 - (4) correlations within models.
- (iii) Discuss the following issues with regard to parameterisation of capital models:
- (1) developing assumptions
 - (2) validation and back-testing
 - (3) sensitivity testing. *(Chapter 22)*
- (h) Describe approaches to the assessment of capital requirements for the following risk types:
- (i) insurance risk
 - (ii) market risk
 - (iii) credit risk
 - (iv) operational risk
 - (v) liquidity risk
 - (vi) group risk. *(Chapter 22)*

- (i) (i) Understand the importance of diversification, and develop appropriate assumptions for capital modelling of diversification between risks.
- (ii) Demonstrate an understanding of how actuarial judgement may apply to capital modelling.
- (iii) Explain some of the areas to consider when approaching a capital modelling exercise. *(Chapter 22)*
- (j) Describe how the principles of practicability and proportionality apply to capital modelling and explain what guidance exists. *(Chapter 22)*
- (k) (i) Describe how to develop an appropriate reinsurance programme for a general insurer.
- (i) Describe how to test the appropriateness of alternative reinsurance structures for a general insurer.
- (ii) Describe how reinsurance purchasing decisions might be impacted by capital management considerations. *(Chapter 7)*
- (l) (i) Describe the following approaches to reserving for outwards reinsurance:
 - (1) gross less net
 - (2) application of standard techniques to reinsurance data
 - (3) use of appropriate factors
 - (4) application of detailed contract terms.
- (ii) Understand the advantages and disadvantages of each of the above methods and the appropriate circumstances in which to use them. *(Chapter 17)*
- (m) Describe the methods and principles of accounting for general insurance business and interpret the accounts of a general insurer. *(Chapter 4)*
- (n) (i) Discuss the purposes of regulating general insurance business.
- (ii) Outline possible methods by which general insurers can be regulated, including advantages and drawbacks of each. *(Chapter 8)*

Pricing

- (a) (i) Understand the various components of a general insurance premium.
(ii) Describe the basic methodology used in rating general insurance business.
(iii) Appreciate the various factors to consider when setting rates.
(Chapters 18 & 19)
- (b) Develop appropriate rating bases for general insurance contracts, having regard to:
(i) return on capital
(ii) underwriting considerations
(iii) reinsurance considerations
(iv) investment
(v) policy conditions such as self retention limits
(vi) the renewal process
(vii) expenses
(Chapter 20)
- (c) (i) Describe the burning cost approach to rating.
(ii) Understand the assumptions required when using this approach.
(iii) Outline the practical considerations when using this approach.
(Chapter 19)
- (d) (i) Describe the frequency / severity approach to rating.
(ii) Understand the assumptions required when using this approach.
(iii) Outline the practical considerations when using this approach.
(Chapter 19)
- (e) (i) Describe how original loss curves can be used in rating.
(ii) Understand the assumptions required when using this approach.
(iii) Outline the practical considerations when using this approach.
(Chapter 19)
- (f) Understand the applications of Generalised Linear Models to the rating of personal lines business and small commercial risks.
(Chapter 19)

- (g) (i) Understand the uses of multivariate models in pricing.
- (ii) Outline the different types of multivariate models. *(Chapter 19)*

- (h) Describe the practical uses of credibility models in a general insurance environment. *(Chapter 18)*

- (i) (i) Outline the similarities and differences between pricing direct and reinsurance business.
- (ii) Describe how to determine appropriate premiums for each of the following types of reinsurance:
 - (1) proportional reinsurance
 - (2) non-proportional reinsurance
 - (3) property catastrophe reinsurance
 - (4) stop losses
- (iii) Describe the data required to determine appropriate premiums for each of the above types of reinsurance. *(Chapter 19)*

- (j) (i) Outline the basic structure of a catastrophe model.
- (ii) Describe the key perils that can be modelled. *(Chapter 18)*