May, 2015

FOUNDATION OF CASUALTY ACTUARIAL
SCIENCE PART-II

[Time : 3 Hours]  
(All questions are compulsory.)  

Marks

Multiple –Choice Question (All Multiple-Choice Questions carries Two Marks Each)

Q.1 A strategy that eliminates price and coupon reinvestment risk on a fixed income portfolio is known as:
   a) Balancing
   b) Securitization
   c) Immunization
   d) None of the above
   
   Marks: 2

Q.2 Which of the following statements is correct?
   a) Macaulay duration = (1/(1+r)^n) * modified duration
   b) Modified duration = (1+r) * Macaulay duration.
   c) Modified duration = (1/1+r) * Macaulay duration
   d) Modified duration = (1/(1+r)) * Macaulay duration
   
   Marks: 2

Q.3 Which of the following methods is not included in the benchmark method for estimating environmental losses?
   a) Aggregate loss development method
   b) Claim development method
   c) Market share method
   d) Survival loss ratio method
   
   Marks: 2

Q.4 The standard for full credibility is 3000 claims. How much credibility is assigned to 450 claims
   a) 38.37%
   b) 38.73%
   c) 0.3783
   d) .3378
   
   Marks: 2

Q.5 If the technical Reinsurance Pure Premium is Rs.27808 and Reinsurance Expected Loss Cost is Rs. 25028, calculate the Reinsurer’s Target Economic Return
   a) 90%
   b) 10%
   c) 11%
   d) 9%
   
   Marks: 2
Q.6 The yield curve under fixed income securities are
   a) The plot of yields versus time to maturity
   b) Downward sloping
   c) Meaning that longer term securities have lower yield than short term
   d) Meaning that short term securities have higher yield than long term.

Q.7

<table>
<thead>
<tr>
<th>City</th>
<th>Percentage of Total Drivers</th>
<th>Percent of Accident Free Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boston</td>
<td>40%</td>
<td>80%</td>
</tr>
<tr>
<td>Pittsfield</td>
<td>15%</td>
<td>95%</td>
</tr>
<tr>
<td>Springfield</td>
<td>25%</td>
<td>85%</td>
</tr>
<tr>
<td>Worcester</td>
<td>20%</td>
<td>90%</td>
</tr>
</tbody>
</table>

A driver is picked at random. If the driver has had an accident what is the chance that the driver is from Pittsfield?
   a) 5.172%
   b) 0.052%
   c) 75%
   d) 0.75%

Q.8 In a simple linear regression to variable have the following relationship:
   \[ y_t = b_0 + b_1 x_t \]

   The term \( b_1 \) denotes
   a) The observation of the independent variable at time t
   b) The observation of the dependent variable at time t
   c) The intercept of the relationship between variables \( x \) and \( y \)
   d) The slope of the relationship between variables \( x \) and \( y \)

Q.9 A retrocession refers to
   a) An insurer purchasing insurance from reinsurer
   b) A reinsurer purchasing insurance cover from an insurer
   c) A reinsurer purchasing reinsurance cover from other reinsurers
   d) None of the above

Q.10 Some of the primary causes of insolvency in the Property/Casualty insurance industry could include all of the following except
   a) Deficient loss reserve due to inadequate pricing
   b) Alleged Fraud
   c) Overstated assets
   d) Regulation

Q.11 Expected claim count =0.065
   Expected loss severity =85,000
   Past loss severity =95,000
Expected loss cost factor = 0.351
Find the reinsurance expected loss cost, assuming claims severity including loss adjustment Expenses follows censored pareto distribution.

a) 2053.35  
b) 2167.43  
c) 1939.28  
d) 8513.10

Q.12 Which of the below is not a type of securitization type of insurance products?  
   a) Weather derivatives  
   b) Risk exchanges  
   c) Catastrophe bonds  
   d) Risks equity calls

Q.13 The variance of the log normal distribution is  
   a) $e^{\mu + \frac{1}{2}\sigma^2}$  
   b) $e^{\mu + \frac{1}{2}\sigma^2} \sqrt{e^{\sigma^2} - 1}$  
   c) $e^{2\mu + \sigma^2} (e^{\sigma^2} - 1)$  
   d) $(e^{\sigma^2} - 1)$

Q.14 A clash treaty may be only exposed by all the following except  
   a) Extra- contractual- obligations  
   b) Excess-of -policy limit damages  
   c) Catastrophic workers compensation accidents  
   d) The claim arising from single event involving single coverage

Q.15 An insurer that invests in assets for a longer period than its liabilities:  
   a) Will be earning higher return  
   b) Accepts Interest rate risk  
   c) Earns lower rate of return  
   d) a and b above

(Essay type questions: All essay type questions carry Ten marks each)

Q.16 a) How is a clash treaty different from excess of loss treaty? Explain briefly the two treaty types and outline the differences. 
   b) Explain any two types of finite reinsurance covers.

Q.17 a) Describe the four functions of reinsurance. 
   b) Outline the actuary’s role in facultative certificate pricing.

Q.18 a) There are three types of risks. Assume 60% of the risks are of type A, 25% of the risks are of type B and 15% of the risks are of Type C. Each risk has either one or zero claims per year. A risk is selected at random
Type of Risk | A Priori Chance of Type of Risk | Chance of a Claim
---|---|---
A | 60% | 20%
B | 25% | 30%
C | 15% | 40%

i) What is the overall mean annual claim frequency

ii) You observe no claim in a year. What is the expected annual claim frequency from the same risk?

iii) You observe one claim in a year. What is the expected annual claim frequency from the same risk?

b) The probability that a single insured will produce 0 claims during the next exposure period is $e^{-x}$. $x$ varies by insured and follows a distribution with density function $f(x) = 36xe^{-6x}$, $0 < x < \infty$

Determine the probability that a randomly selected insured will produce 0 claims during the next exposure period.

Q.19 a) State the formula for Capital Asset Pricing Model clearly indicating what do the terms in the formula denote.

b) Explain the theory behind Capital Asset Pricing Model that is to be considered in conclusion while pricing insurance products.

c) Identify any one problem associated with application of Capital Asset Pricing Model to insurance pricing.

Q.20 a) Write a short note on catastrophe models and its various components.

b) In case of latent claims, what are the various issues faced by an insurer and state any four risk factors used when underwriting such risks. You may explain using ‘Asbestos’ example.

Q.21 a) What are the possible reasons for regulating the insurance industry? Outline briefly.

b) State and briefly explain the six general components of a reinsurer’s statutory loss reserve.

Q.22 a) Describe Briefly on GAAP value citing three examples involving the principle.

b) List out examples for any two ratios that help to identify an insurance company’s operating condition. Give the formula for (the examples of) the respective ratios.