

BR3204/BR3210

**NANYANG TECHNOLOGICAL UNIVERSITY**

**SEMESTER 1 EXAMINATION 2022-2023**

**BR3204 - Property and Liability Insurance**  
**BR3210 - Property and Liability Insurance**

November 2022

Time Allowed: 2½ hours

**INSTRUCTIONS**

- 1 This paper contains **FOUR(4)** questions and comprises **SIX(6)** pages.
  - 2 Answer **ALL** questions.
  - 3 This is a **Closed-book** examination.
  - 4 The number of marks allocated is shown at the end of each question.
  - 5 Begin your answer to each question on a separate page of the answer book.
  - 6 Answers will be graded for content and appropriate presentation.
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**Note: Exam Questions begin on Page 2**

Question 1

*Multiple Choice Questions (2 marks  $\times$  10 = 20 marks).* This question contains **TEN(10)** questions. Each question carries **TWO(2)** marks. For each question, there is only ONE correct answer. List your answers together with each question number in the answer book.

- (a) Which of the following is NOT a possible driver of underwriting cycle?
- A. Low barriers to entry.
  - B. Catastrophes and other unexpected events.
  - C. Unwillingness to lose market share.
  - D. Risk-based capital requirements.
- (b) Which of the following is the feature of weather derivatives?
- A. Addressing the issue of moral hazard
  - B. No complicated loss checking and adjustment procedures
  - C. Payout of weather derivatives are based on index, different from actual loss
  - D. All of the above
- (c) About a credibility factor, which of the following is NOT true?
- A. A credibility factor increases with the quality of the historical data.
  - B. A credibility factor increases with the quality of the collateral data.
  - C. A credibility factor is trying to find a balance between responsiveness and stability.
  - D. A credibility factor is usually a function of risk exposure.
- (d) Which of the followings is NOT a legal principle of property insurance?
- A. Insurable interest
  - B. Exclusions
  - C. Principle of tort
  - D. Principle of Indemnity
- (e) Which of the following statements is NOT correct about a Bonus-Malus System (BMS)?
- A. The premium of certain policyholder is completely determined by the insured's class in the preceding period and the claim history
  - B. The system should be designed for an average claim that can keep the distribution of policies in the system balanced
  - C. The higher the elasticity, the more efficient and sustainable of the system
  - D. It can be evaluated by looking at its relative stationary average level (RSAL)

Note: Question 1 continues on page 3

Question 1 (continued)

- (f) Which of the following statement is true about enterprise risk management (ERM)?
- A. ERM focuses on managing each individual risks to tackle them one by one.
  - B. ERM focuses on minimizing risks altogether.
  - C. The time horizon chosen for risk management is important.
  - D. Board of directors oversees the ERM practices and only are involved in ERM occasionally.
- (g) Which of the following is NOT a way for insurance companies to limit their risk exposures when writing an insurance policy?
- A. Apply limits to claim amounts on any occurrence.
  - B. Apply limits to aggregate claim amounts of the policy.
  - C. Seek appropriate reinsurance arrangements to cede undesirable exposure.
  - D. Tighten the claim assessment procedure to slow down or reduce claim payments.
- (h) Which of the following conditions may affect the validity of applying a chain ladder method when estimating claim liabilities?
- i) There have been drastic changes over the last 2 years in the claim assessment procedures resulting in faster claim settlement.
  - ii) The business has a slight shrink in size during the past 3 years.
  - iii) The triangle data has not been inflation adjusted but the inflation rate has been stable in the past and is expected to be stable in the future.
  - iv) The company is in process of acquiring a small competitor and is expecting small changes in its insurance portfolio.
- A. i and ii
  - B. ii and iii
  - C. i only
  - D. ii, iii and iv
- (i) Which of the following is NOT a possible response to identified risks under ERM?
- A. Reducing the risks by taking active steps to limit the impact of a risk occurring.
  - B. Completely remove the risks by necessary actions.
  - C. Transfer the risk through insurance.
  - D. Ignore the small risks until it actually occurs and generate large enough negative impacts.

Note: Question 1 continues on page 4

Question 1 (continued)

- (j) Which one of the following statement is correct for estimating insurer's profits?
- A. The net earned premium = net written premium + net unearned premium at the start of the period - net unearned premium at the end of the period
  - B. The gross claim expenses = Claim payments + outstanding claims at the start of the period
  - C. The gross claim expenses = Claim payments + outstanding claims at the end of the period
  - D. The gross underwriting profit = Gross earned premium – gross claim expenses

(TOTAL: 20 marks)

Question 2

- (a) What is moral hazard? What behavior changes may moral hazard cause?  
(8 marks)
- (b) What is the law of large numbers? What is the central limit theorem? Explain the two theorems in words.  
(8 marks)
- (c) How to evaluate a Bonus-Malus System (BMS)? List two commonly used evaluation tools and explain their meanings.  
(8 marks)
- (d) Identify and briefly explain four purposes for reserving.  
(8 marks)
- (e) Suggest **FIVE(5)** reasonable premium basis to be considered when an insurer writes directors'/ officers' liability insurance policy to a corporation. Briefly explain your choices.  
(8 marks)

(TOTAL: 40 marks)

Question 3

You are given the following historical premium data for an auto-insurance company:

<b>Calendar Year</b>	<b>Earned Premium</b>
2019	4,284,000
2020	5,273,000

Assume the policies have a one-year term and are uniformly issued. The following rate changes have occurred:

<b>Date</b>	<b>Rate Change</b>
Jan 1, 2018	5%
Nov 1, 2019	8%
May 1, 2020	12%

- (a) Calculate the on-level factors for the year 2019 and 2020.  
(9 marks)
- (b) Calculate the earned premiums at current level for the year 2019 and 2020.  
(6 marks)
- (c) The incurred loss in 2020 is 4,938,300. Calculate the loss ratio of 2020, using the on-level premium of 2020.  
(5 mark)
- (TOTAL: 20 marks)

Question 4

You are given the following claim amount information about accident year 2020 (AY20) on 31<sup>st</sup> December 2021.

In development year (DY) 1, the total claims paid for AY20 was 1958; in DY2, the total claims paid for AY20 was 876.

Accident years	DY1	DY2	DY3	DY4	DY5
2020	1958	876	-	-	-

- (a) The claims paid amounts are provided in their nominal values with no inflation adjustments. Given that the estimated inflation rate from mid-year 2020 to mid-year 2021 was 2%, inflation adjust the claim payment amounts for every DY for AY20, assuming claim payments occur at mid-year on average.

(4 marks)

- (b) The cumulative claim payment pattern in the past has estimated development factors for each DY as follows:

DF1	DF2	DF3	DF4
1.36	1.1	1.08	1.02

- (i) Estimate the ultimate claim payment for AY20.

(4 marks)

- (ii) Estimate the claim payment for AY20 in calendar year 2022.

(4 marks)

- (iii) Given that the expected inflation from mid-2021 to mid-2022 is 1.5% and the discount rate is 2.5% effective per annum. Calculate the inflation and discount adjusted claim amount for AY20, DY3 as at 31<sup>st</sup> December 2021.

(3 marks)

- (c) The total unearned premium at 31<sup>st</sup> December 2021 is 3185. The expected loss ratio for the unexpired policy is 85% and the claim management expenses is 4% of total premium. The risk margin is estimated at 20% of total unexpired risk estimation.

- (i) Estimate the unexpired risk based on the information provided.

(2 marks)

- (ii) What should be the premium liability estimate for the company?

(3 marks)

(TOTAL: 20 marks)

**- END OF PAPER -**