PUSASQF204
Introduction to Actuarial Model

Time: 2 hours
Total Marks: 60 marks

Note:

1) **The candidate has option to either attempt question 4A or question 4B. Rest all questions are mandatory.**
2) **Numbers to the right indicate full marks.**
3) **The candidates will be provided with the formula sheet and graph papers (if required) for the examination.**
4) **Use of approved scientific calculator is allowed.**

Q.1 **[15 Marks]**

1. Derivative contract prices movements generally are ______
   a. homoskedastic
   b. heteroskedastic
   c. depends on economic cycle
   d. time-varying

2. Which of the following is limitation of modelling?
   a. As a rule, models are more useful for comparing the results of input variations than for optimizing outputs i.e. easier to predict outputs than what is required as inputs to get particular output.
   b. Complex systems with stochastic elements, such as the operation of a life insurance company, cannot be properly described by the models that are capable of producing results that are easy to interpret.
   c. None of the above
   d. 1 and 2

3. Which one is not the form of data analysis?
   a. Descriptive
   b. Inferential
   c. Qualitative
   d. Predictive

4. Which of the following is principle of Experimental design?
   a. Repetition
   b. Replication
   c. Calibration
   d. Operationalization

5. Under which consideration, of generating best co-efficient, are the estimators statistically optimal?

   a. Design of Experiment Principles
   b. Linear square criterion
   c. Least square criterion
   d. Numerical methods Forte

6. __________means any number, code, or other identifier, assigned to a data principal under a law made by Parliament or any State Legislature which may be used for the purpose of verifying the identity of a data principal.

   a. Government principal
   b. Official identifier
   c. Verification code
   d. Number identifier

7. The natural person to whom the personal data relates is _

   a. data owner
   b. data fiduciary
   c. data principal
   d. data processor

8. Which of the following is not sensitive information about the customer?

   a. Permanent Account Number
   b. Their Premium Payment Status
   c. Genetic Data
   d. Sexual Orientation.

9. Changes in the value of Cryptocurrencies will be modelling using__state space and ____ time space.

   a. Discrete, discrete
   b. Discrete, continuous
   c. Continuous, Discrete
   d. Continuous, Continuous

10. The Age at death of members of a life insurance policy that expires at 60 is an example ____ type of data.

   a. Cross – sectional
   b. Longitudinal
   c. Truncated
   d. Censored

Q.2A **[5 Marks]**

What is meant by data security and privacy?

Q.2B **[5 Marks]**

List down the assumptions under modelling process.

Q.2C **[5 Marks]**

A large bancassurer that sells all types of protection business, and has done so for many years, is considering analysing its data using 'big data' methodologies. Suggest possible reasons why the company may be considering this course of action.

Q.3A **[5 Marks]**

Ahmed is a Research Intern at 18 Sigma Researchers consisting of multiple research groups across domains such as Medicine, Physics, technology in insurance domain. You are his manager and he has come to you to understand the concept and importance of reproducible research. Explain it to him.

Q.3B **[5 Marks]**

Arjun, has recently joined the largest general insurance company in Quantia. Upon his joining , he found out that the company uses linear regression approach to price individual health insurance policies. Arjun had learnt in University that use of Non – Linear Regression in health insurance is better. Upon discussion with the Actuarial Vice President, he was asked to explain the methodology and its pros and cons focused on health insurance pricing but not limited to it. Explain Nonlinear Least Squares Regression along with its advantages and disadvantages.

Q.3C **[5 Marks]**

StarTree Investment Fund is currently in the process of modelling its Assets and Liabilities. The current approach uses deterministic models but the Head of Investment Division has asked for using the stochastic model of interest rates in order to determine the values of the assets and liabilities.

For this scenario and in general , explain the difference between stochastic vs deterministic model.

Q.4A **[15 Marks]**

Quantia has recently privatised the Life Insurance industry. Various life insurance companies have started with a goal of appealing to different consumers. You work for a Life Insurance Consultancy who was recently approached by one such insurer in order to receive help with creating a pricing model for a new product.

As a Senior Associate, outline the basic features of an Actuarial Model to be used to determine the annual premium rates for a new Life Insurance product.

OR

Q.4B **[15 Marks]**

Actuaria privatized the Insurance industry a few years back. MoonGame was one company that started a Life and General Insurance company post the privatization. An Actuarial Analyst has contacted you for your prior expertise in the domain to understand the importance and method used to perform model validation.

Describe briefly to the Analyst the need and how model validation can be performed.