

**MASTER OF ARTS (ECONOMICS)**

**Term-End Examination**

**December, 2007**

**MECE-003 : ACTUARIAL ECONOMICS :  
THEORY AND PRACTICE**

*Time : 3 hours*

*Maximum Marks : 100*

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**Note :** *Attempt questions from each section as per instructions given under each section.*

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**SECTION A**

*Answer any **two** questions from this section. 2×20=40*

1. Why is the Asset Pricing Theorem given by Harrison and Kreps important for the insurance market ? If you accept the view that the insurance market operates with the features of incomplete market, what modifications in the above model will you introduce while considering investment in insurance assets ?
2. (i) How does classical credibility theory differ from the one formulated on the basis of Bayes' theorem ? Which approach will you prefer ? Why ?  
  
(ii) Let  $X_1$  be the outcome of a single trial and let  $E(X_2 | X_1)$  be the expected value of the outcome of a second trial. You are given the following information :

| Outcome = T | $P(X_1 = T)$ | Bayesian estimate<br>for $E[X_2   X_1 = T]$ |
|-------------|--------------|---|
| 1           | 5/8          | 1.4   |
| 4           | 2/8          | 3.6   |
| 16          | 1/8          | —   |

Determine the Bayesian estimate for  $E[X_2 | X_1 = 16]$ .

3. What is Panjer recursion ? Discuss its use in collective risk modelling.
4. What is the fundamental principle of equivalence used in insurance ? Do you think some changes have come up recently in applying that principle due to inclusion of financial valuation practices ? Give reasons in support of your answer.

**SECTION B**

Answer any **four** questions from this section.  $4 \times 12 = 48$

5. You are asked to compute the aggregate claim distribution in the collective risk model. Which method would you like to follow ? List the main features of that method.
6. Spell out the important components of a Dynamic Financial Analysis (DFA) model.
7. Discuss the insurance modelling used in classical risk theory. Do you agree with such a framework ? Give reasons in support of your answer.
8. John buys a 10-year bond, of face and redemption amount,  $x$ , with 10% annual coupons at a price to yield 10% effective annual rate. The coupons, when received, are reinvested immediately at 8% effective annual rate. Immediately after the receipt (and reinvestment) of the 4<sup>th</sup> coupon, John sells the bond to Smith for a price that will yield effective annual rate  $i$  to the buyer. The yield rate that John earns on his investment is 8% effective annual rate. Discuss the steps you will follow to find the value of  $i$ .
9. Six fair dice are rolled one time. What is the probability that each face appears ?

10. In Chebyshev's inequality let  $S_n = \sum_{i=1}^n G_i$  where

$G_1, \dots, G_n$  are pairwise independent variables with the same mean  $\mu$  and deviation  $\sigma$ . Show that

$$\Pr \left\{ \left| \frac{S_n}{n} - \mu \right| \geq x \right\} \leq \frac{1}{n} \left( \frac{\sigma}{x} \right)^2.$$

**SECTION C**

*Answer both the questions from this section. 2x6=12*

**11.** Write short notes on any **two** of the following :

- (i) Single premium principle
- (ii) Risk neutral valuation
- (iii) GEV distribution

**12.** Differentiate between any **two** of the following :

- (i) Gamma and Poisson distribution
- (ii) Non-catastrophe and Catastrophe losses
- (iii) Individual excess of loss and stop loss reinsurance