YASHWANTRAO CHAVAN MAHARASHTRA OPEN UNIVERSITY, NASIK

HOME ASSINGMENT - (2016-17)

.....

B.Sc. Actuarial science (V45)

.....

Instructions for the Students:

1) All Questions are compulsory.
2) Each Sub-question carries 5 marks.
3) Each Sub-question should be answered between 75 to 100 words. Write every question's answer on separate page.

.....

V45: S04031 (business economics –II)

1 Define social efficiency. Describe the situation of MSC > MSB, and state how social efficiency could be attained in this situation. [5]

2 What is globalization? Describe the effects of globalization. [5]

3 Explain three methods of calculating a nation's national income. [5]

4 Explain the concepts of inflationary gap and recessionary gap with the help of Keynesian model. [5]

V45: S04032: estimation and hypothesis testing

1 (a) Based on a random sample of size n from G(10, λ) distribution, derive m.l.e. of λ. [3]

(b) Obtain 95% confidence interval for population variance using the following sample data;-
23.67 29.11 32.16 40.56 31.58 25.00 30.15 34.78 28.09
State the assumptions you make. [2]

2 (a) A coin is such that probability of getting a head on its toss is p, an unknown constant.
To test H_0: p =2/3 against H_1: p=1/3, it is to be tossed 5 times and H_0 is to be rejected if it shows at most one head.
Calculate probability of Type I error. [1]

2(b) Consider the following data regarding Claims on Home insurance portfolio and motor insurance portfolio.

Portfolio	Mean Claim	S.D. of Claim	Sample Size
Home Insurance	24,058	3,789	23
Motor Insurance	31,256	4,899	17

Based on these independent sample data, test whether H_0: "Mean Claim amount for motor insurance claims is 3000 more than that for Home insurance claims" can be retained at 5% level of significance? [4]

Q3 An actuarial student working in a life insurance company is analysing policy withdrawals on a sample of 2000 policies.

She classified 500 policies with annual premium greater than or equal to INR 50,000 as large policies and remaining policies with annual premium less than INR 50,000 as small policies. She said, "Within a policy year, 20% of large policies have been withdrawn by policyholders whereas 30% of the small policies have been withdrawn by policyholders. Our aim in the next business plan is to reduce the small policies in order to reduce the policy withdrawals".

Carry out a test to assess whether there is association between policy size (small / large) and policy withdrawals by policyholders at 1% level of significance. [5]

Q4 A software company has developed a new software package to help the system analysts working in insurance industries to reduce the time required to design, develop and implement an information system. To evaluate the benefits of this new software the insurance company has selected 24 system analysts, out of which 12 of them were instructed to produce the information system using current technologies and the rest of them were trained and then were asked to produce the information system using new software. The data set is as given below.

Time required completing the information system using

Current Technology (x1)	300	280	344	385	372	360	288	321	376	290	301	283
New Software (x2)	276	222	310	338	200	302	317	260	320	312	334	265

$\sum x_1 = 3,900$ $\sum x_2 = 3,456$ $\sum x_1^2 = 12,85,096$ $\sum x_2^2 = 10,16,622$

(a) Test whether both software packages exhibit same variance. (2)

(b) Hence test that the new software package will provide a shorter mean project completion time than the current technology? Use α=0.05. (3)

V45: S04033 :life insurance ,principal ,products and practices

1. Describe various insurance principles with examples. [5]

2. State group insurance plans and at least two points of difference in each plan. [5]

3. How low premium will affect solvency margin? Explain. [5]

4. (a) Describe various types of claims and claims concession. [3]

   (b) Calculate the claim value:
   Endowment 25 years
   Sum assured 40000
   Date of commencement 20.07.1999
   Date of death 18.02.2012
   Quarterly premium Rs. 320 due in January 2012 not paid bonus vested RS 30000
   Interim bonus declared after valuation 31.03.2011 Rs. 70 per thousand. [2]

V45: S04034 :communication and research methodology

1 A researcher wants to develop a cancer drug.

Give steps in his research project. [5]

2 Your friend has written to you saying that Five years ago he took a housing loan of Rs. 10,00,000 with a term of ten years. The loan was to be repaid by monthly EMIs starting immediately. He further mentioned that he paid his EMIs regularly for 5 years and then he thought off repaying the balance loan in one go as he suddenly got a share from sale of his family property. Your friend was shocked to find that the Bank that had granted him a loan demanded Rs. 6,16,933 against his expectation of Rs. 5,00,000. The Bank also said that they have not charged him any penalty for earlier repayment.

Write a letter to your friend explaining him why the Bank could be demanding much larger amount than 50% of the loan amount. [5]

3 Prepare a Power Point Presentation on "How to take your classmates for an overnight picnic?" [5]

4 Your friend appeared for an interview today with a company, where you are scheduled for tomorrow. Your friend was asked:" If you were a type of fish, what type of fish would you be?"

If you were there in your friend's place, how would you have responded to this and why? [5]

V46: S04051 :risk models for general insurance

1 For a general insurance policy, the settled amount of a particular claim (denoted by X) has uniform distribution over the interval $(0, \theta)$, where θ is the maximum claim size permissible for that risk. An analyst, who has knowledge of X but does not know θ, wants to guess the value of θ from a single observed value of X. The analyst prefers to use the absolute error loss function for this purpose.

If the prior distribution of θ is described by p.d.f. $f(\theta) = \theta e^{-\theta}$ for $\theta > 0$, derive the Bayes estimator of θ with respect to the absolute error loss function. [5]

2 An insurer believes that claim amounts, X, on its portfolio of pet insurance policies follow an exponential distribution with mean £200.
A reinsurance policy is arranged such that the reinsurer pays X_R, where

$X_R = 0$ if $0 < X < £50$
$= X - 50$ if $£50 \le X < M$
$= M - 50$ if $X \ge M$

Calculate M such that $E[X_R] = £100$. [5]

3 (a) Why do we need EBCT models? [2]

(b)The table below shows aggregate annual claim statistics for four different products over a period of five years. Annual aggregate claims for product *i* in year *j* are denoted by X_{ij}.

Product (i)	$\bar{X}_i = \frac{1}{5}\sum_{j=1}^{5} X_{ij}$	$\frac{1}{4}\sum_{j=1}^{5}(X_{ij} - \bar{X}_i)^2$
1	125	300
2	85	60
3	140	35
4	175	100

Calculate the credibility premium of Product 1 under the assumptions of EBCT Model 1. [3]

4 (a)Explain what is the difference between Collective risk model and individual risk model. [2]

4 (b) A compound distribution $S = X_1 + X_2 + ... + X_N$ has claim number distribution:

$P(N = n) = 9(n +1)\ 4\text{-}(n+2)$, $n = 0,1,2,...$

Find the value of E(S)in terms of E(X). [3]

V46: S04052 reserving and time series

1 Claims on a portfolio of insurance policies arrive as a Poisson process with parameter 100. Individual claim amounts follow a normal distribution with mean 30 and variance 52 . The insurer calculates premiums using a premium loading of 20% and has initial surplus of 100.

Show that for this portfolio the value of adjustment coefficient *R* is 0.011 correct to 3 decimal places. [5]

2 The table below gives the cumulative incurred claims by year and earned premiums for a particular type of motor policy (Figures in £000s).

Claims paid to date total £15,000,000. The ultimate loss ratio is expected to be in line with the 2003 accident year.

	Development year				
Accident Year	*0*	*1*	*2*	*3*	*Earned Premiums*
2003	3,340	3,750	4,270	4,400	4,800
2004	3,670	4,080	4,590		4,900
2005	3,690	4,290			5,050
2006	4,150				5,200

Ignoring inflation, use the Bornhuetter-Ferguson method to calculate the total reserve required to meet the outstanding claims, assuming that the claims are fully developed by the end of development year 3. [5]

3 An insurance company has data for claim amounts from previous claims. It believes that the claim amount is primarily influenced by two variables:

xi the type of geographical area in which the house is situated. This can take one of 4 values.

yi the category of the age of the house where the three categories are 0–29 years, 30-59 years and 60 years +.

It wishes to model claim amounts using this data and the generalised linear model assuming y to follow Gamma distribution with appropriate canonical link function. The insurance company is investigating models which take into account these variables and has the following table of values:

Model	Choice of predictor	Scaled Deviance
A	1	900
B	Age	789
C	Age +location	544
D	Age * location	541

Explain, by analysing the scaled deviances, which model the insurance company should use. [5]

4 State the Markov property and explain briefly whether the following processes are Markov:

AR(4)
MA(3)
ARMA (1, 1)
ARIMA(0,1,1) [5]

V45: S04053 :business environment

1 “Primary and secondary markets are interlinked and interdependent.” Explain this statement. [5]

2 Life insurance industry in India is a well-set segment of insurance sector. Explain the role of an actuary in a life insurance company. [5]

3 Discuss the famous failure case of Enron. [5]

4 Operational risks do not include risks from certain factors. List some such important factors. [5]

****