 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION - **STATISTICS**

THIRD SEMESTER – **NOVEMBER 2012**

# ST 3956 - ACTUARIAL STATISTICS

Date : 08/11/2012 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

Section – A

Answer all the questions: ( 10 x 2 =20)

1. Find the present value at rate of interest 7% p.a. of Rs.500/-payable in 4 years and months.
2. What is discount?
3. Define deferred annuity and deferment period.
4. Write the formula for the present value of increasing annuity wherein the successive instalment from a geometric distribution.
5. Define expectation of life and write and expression for ex.
6. What is meant by Whole Life Assurance?
7. Prove that A x:n = D x + n / Dx
8. What is the benefit that is represent by a x : n - a x : n-1?
9. What are the defects in the system in the system of charging natural premiums?
10. Given that Ax =0.7115 and a x = 6.5 determine the rate of interest.

Section –B

Answer any five questions: ( 5 x 8 =40)

1. a) Find the effective rate p.a. corresponding to the nominal rate of 8% p.a. convertible quarterly.

b) Find the nominal rate p.a. convertible quarterly corresponding to an effective rate of 8% p.a.

1. A has taken a loan of Rs. 2000 at a rate of interest 4% p.a. payable half yearly. He repaid

Rs.400 after 2 years, Rs.600 after a further 2 years and cleared all outstanding dues at the

end of 7 years from the commencement of the transactions. What was the final payment

made by him?

1. A has right to receive an amount of Rs.1000 at the end of 12 years from now. This right has been sold to B for a present value calculated at the rate of 8% p.a. The money thus received was invested by A in deposit account at 9% p.a. payable half yearly. After 8 years the account had to be closed and A then invested the amount available at 6% p.a. in another bank. How has A gained or lost in this transaction, as at the end 12 years?
2. Derive an expression to find accumulated value of deferred annuity due.
3. Find the following probabilities:
4. a life aged 35 will die between that ages 45 and 50
5. a life aged 35 will not die between that ages 45 and 50
6. a life aged 35 will die in the 10th year from now.
7. a life aged 35 will not die in the 10 year from now.
8. Describe the relative advantages and disadvantages of the policy year method as against life year method and calendar year method.
9. Using commutation functions based on LIC ( 1970 -1973) Ultimate mortality table at 6% interest. Calculate for a person aged 40;
10. The present value of whole life assurance of Rs.10,000/-
11. The present value of double endowment assurance of Rs.10,000

for 15 years term. Also calculate the present value of endowment assurance and the pure endowment each for Rs.10, 000 for 15 years term.

1. Derive an expression for Increasing Temporary life annuity.

**Section – C**

Answer any two questions: ( 2 x 20 = 40 )

1. a) The cash purchase price of a bike is Rs. 10,000. A company however offers instalment plan where under an immediate payment of Rs. 2000 is to be made and a series of 5 equal half-yearly payments made thereafter, the first installment being payable at the end of 6 months. If the company wishes to realize a rate of interest of 12 % convertible half-yearly in the transaction, calculate the half-yearly instalment.

b) A fund is to be set up out of which a payment of Rs.100 will be made to each person who in any year qualifies for membership of a certain procession. Assuming that 10 person will qualify at the end of one year from now, 15 at the end of 2 years, 20 at the end of 3 years, and so on till the number of qualifiers is 50 per annum. When it will remain constant? Find at 5% p.a. effective. What sum must be paid in to the fund now so that it sufficient to meet the outgo?

1. a) A loan of Rs. 16,000/- is repayable by level instalment of principal and interest, payable yearly in arrears over 15 years. The rate of interest is 8% p.a. for the first 6 years and 7% p.a. thereafter. Calculate the level yearly instalment and interest contained in the 1st, 2nd, 9th & 10th instalment.

b) Of three person A, B and C, aged 40, 45 and 50 respectively, find the probability that at least one of them will not die between the ages 65 and 70.

1. Explain in detail the stages in the construction of the life table.
2. a) The following particulars are given:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **x** | 25 | 26 | 27 | 28 | 29 | 30 |
| **lx** | 97380 | 97088 | 96794 | 96496 | 96194 | 95887 |
| **dx** | 292 | 294 | 298 | 302 | 307 | 313 |

Calculate ignoring interest, allowing interest @ 6 % and expenses:

* 1. The value of temporary assurance of Rs. 1000 for 2 years for a person aged 25.
  2. The value of endowment assurance benefit of Rs. 1000 for 4 years to a person aged 25.

b) Prove that = n ax

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