LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **STATISTICS**

FIFTH SEMESTER – **APRIL 2012**

# ST 5404 - ACTUARIAL STATISTICS

 Date : 27-04-2012 Dept. No. Max. : 100 Marks

 Time : 1:00 - 4:00

**ST-5404 actuarial STATISTICS MAX: 100 Marks**

**Section – A**

 **(Answer all the questions) (10 x2 =20)**

1. What is the present value of Rs.5,000 receivable at the end of 75 years, the rate of interest being taken as 6 % p.a?
2. Find the nominal rate p.a convertible quarterly corresponding to an effective rate of 8% p.a.
3. Show that $\frac{a\_{6n}}{a\_{3n}}=1+v^{3n}$
4. Give the formula for an and Sn
5. Evaluate v60 @ 6.2%
6. Write an expression 10P42, 10 │ 5P35.
7. Define dx.
8. What is a temporary assurance?
9. What is the need for a commutation function?
10. Expand Sx in terms of Dx

**Section – B**

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

1. A sum of Rs.2000 is invested at a rate of interest of 5%p.a. After 7 years, the rate of interest was changed to 5% p.a. convertible half yearly. After a further period of 3 years, the rate was again changed to 6%p.a. convertible quarterly. What is the accumulated value at the end of 15 years from the commencement?
2. Define the following:
3. Annuity
4. Immediate annuity
5. Annuity due
6. Deferment period
7. Calculate the present value of a deferred annuity payable for 10 years certain, the first payment falling due at the end of 6 years from the present time. The annuity is payable at the rate of Rs. 100 p.a. for the first 5 years and Rs.200 p.a. thereafter.

(a5 = 4.3295, a10 = 7.7217, a15 = 10.3797)

1. 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 profession. Assuming that 10 persons 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 into the fund now so that it sufficient to meet the outgo.
2. Derive the expression to find the present value and accumulated value of Increasing

 annuity where in the successive installment form a geometric progression.

1. Find the office annual premium for a capital redemption assurance policy of Rs. 3000 redeemable at the end of 20 years, assuming interest rate of 6% and a loading of 8% of office premium.
2. Using the LIC ( 1970 – 73 ) Ultimate table find the following probabilities

1. that a life aged 35 dies within 12 years
2. that a life aged 40 dies not earlier than 12 years and not later than 15 years
3. that a life aged 52 survive 12 years
4. that a life aged 52 will not die between age 65 and 70 ( 2+2+2+2)
5. Explain Pure Endowment Assurance.

**Section – C**

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

1. Explain the various types of annuity and derive the expression for present value and accumulated value of an immediate annuity certain and deferred annuity certain.
2. a)A deposit annually Rs. 200 p.a. for 10 years, the first deposit being made one year from now; and after 10 years the annual deposit is enhanced to Rs. 300 p.a. Immediately after depositing the 15 payment he closes his account. What is the amount payable to him if interest is allowed at (i) 6% p.a. (ii) 9% p.a.?

 b) What is the principle of insurance? How has endowment type assurance

 emerged?

1. a) Fill in the blanks in the following portion of a life table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Age X** | **lx** | **dx** | **qx** | **px** |
| **10** | **1000000** |  | **0.00409** |  |
| **11** |  |  | **0.00370** |  |
| **12** |  |  |  | **0.99653** |
| **13** |  |  |  | **0.99658** |
| **14** |  |  | **0.00342** |  |

b) Using commutation function based on LIC ( 1970 – 73) ultimate mortality table at 6% interest calculate for a person aged 40

1. The present value of Whole Life Assurance of Rs.10000
2. The present value of Double Endowment Assurance of Rs.10000

for 15 years term . Also calculate present value of Endowment Assurance and Pure Endowment of each for Rs. 10000 for 15 years term.

 22. a**)** Explain Rx ,Mx,Dx and obtain expression for ( IA) x : n

 b)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 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 benefits of Rs. 1000 for 4 years to a person aged 25.
3. The value of a Pure Endowment of Rs. 600 for a person aged 27 receivable on attaining age 30.

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