LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – **NOVEMBER 2012**

# ST 5404 - ACTUARIAL STATISTICS

Date : 10/11/2012 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

**Section – A**

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

1. The amount with compound interest of a certain principal at 5% p.a. is Rs. 3969. Find the principal when period is 2 years.
2. What is meant by discount?
3. What is the effective rate p.a. corresponding to a nominal rate of 8 % p.a. convertible monthly?
4. Evaluate v9s13 @ 9 %
5. Define an annuity.
6. Show that 
7. What is perpetuity due?
8. Define qx.
9. Give the expression for ex.
10. Write a short note on term assurance.

**Section – B**

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

1. The amounts for a certain sum with compound interest at a certain rate in two years and in three years are Rs. 8820 and Rs. 9261 respectively. Find the rate and sum.
2. 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 transaction. What is the final payment made by him?
3. The cash purchase price of a bike is Rs. 10,000. A company however offers instalment plan 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.
4. 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.

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

1. Derive the formula for accumulated value and present value of annuity certain due.
2. Using the LIC ultimate table find the following probabilities:
   1. a life aged 35 dies within 12 years.
   2. a life aged 40 dies not earlier than 12 years and not later than 15 years.
   3. a life aged 2 survives 12 years
   4. a life aged 52 will not die between ages 65 and 70
3. What are the points to be borne in mind in deciding
4. Period of investigation?
5. Period of selection?
6. Method to be used for investigation?
7. Derive an expression for A x:n.

**Section – C**

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

1. a) 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 of 12 years?

b) Derive an expression to find the present value for the following variable annuities:

1. Increasing annuity
2. Immediate Increasing Perpetuity
3. Increasing annuity due
4. Increasing Perpetuity due
5. a) A loan of Rs. 3000 is to be repaid with interest at 6% p.a. by means of an immediate annuity for 10 years. Find the level payment. What will be the interest and principal contained in the 5th instalment? What will be the principle outstanding immediately after the 8th payment is made?

( 10 + 10)

b) In lieu of a single payment of Rs. 1000, at the present moment a person agrees to receive 3 equal payments at the end of 3 years, 6 years and 10 years respectively. Assuming a rate of interest of 6% p.a. what should be the value of each of the 3 payments? ( 10 + 10)

21. a) Write down expression for probability in the under mentioned cases:

(i) Life aged 25 dies between ages 60 and 65

(ii) Of the two life aged 25 and 30, at least one life dies before attaining age 70

(iii) Of three lives aged 40, 40 and 45, exactly two lives survive 10 years

(iv) Life aged 28 survives 12 years and dies in the 13th, or 14th year.

b) Fill up 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 |  |

( 10 + 10)

1. a) A person aged 30 years has approached a life office for special type of policy providing for the following benefits:
2. Rs. 1000 on death during the first 5 years
3. Rs. 2000 on death during the next 5 years
4. Survival benefit of Rs. 500 at the end of the 5th year
5. Further payment of Rs. 2000 on survivance to 20 years.
6. An annuity of Rs. 200 per annum payable in his life time, the first such payment falling due along with the survival benefits of Rs. 2000.

b) Derive the expression for Ax and (IA) x : n. ( 10 + 10)

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