LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – STATISTICS

THIRD SEMESTER – NOVEMBER 2009

ST 3956 - ACTUARIAL STATISTICS

Date & Time: 12/11/2009 / 9:00 - 12:00   Dept. No.   Max. : 100 Marks

SECTION A

Answer ALL questions.   **(10 x 2 =20 marks)**

1. The accumulated value of a certain principal at 5 % p.a. is Rs. 3969. Find the principal when the period is 2 years.
2. What is discounting?
3. Find the effective rate p.a. corresponding to a nominal rate of 8% p.a. convertible half-yearly.
4. A sum of money is invested at 4% p.a. effective. How long will it take to double itself?
5. Define immediate annuity certain and annuity due.
6. Find the accumulated value of an 8 year annuity of Re. 1 at the end of 5 years.
7. Show that $ä = (1 + i) a$
8. Define immediate perpetuity and perpetuity due.
9. What is double endowment assurance?
10. Find the probability that a life aged 35 will die between 45 and 50 using LIC ultimate table.

SECTION B

Answer any FIVE questions.   **(5 x 8 =40 marks)**

11. Differentiate between Nominal and Effective rates of interest.
    A sum of Rs. 20,000 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 commencement?
12. 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?
13. Derive the expressions for the present value and accumulated value of an immediate annuity certain
14. A loan of Rs. 3000 is to be repaid by level annual installments of principal and interest over a period of 10 years, the rate being 10 % p.a. Find
    (i)   the annual installment
    (ii)   the interest contained in the 6th payment
    (iii) the principal outstanding after the 6th payment

15. Find the probabilities that
    (i)   a life aged 35 will die between the ages 45 and 50
    (ii)   a life aged 35 will not die between the ages 45 and 50
    (iii) a life aged 35 will die in the 10th year from now
    (iv)   life aged 35 will not die in the 10th year from now

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16. Explain the relative advantages and disadvantages of the policy year method as against life year method and calendar year method.

17. The following particulars are given:

x	25	26	27	28	29	30
l_x	97380	97088	96794	96496	96194	95887
d_x	292	294	298	302	307	313

Calculate ignoring interest and expenses:
  (i) The value of temporary assurance of Rs. 1000 for 2 years for a person aged 25.
  (ii) The value of endowment assurance benefit of Rs. 1000 for 4 years to a person aged 25.

18. Derive the formula for and and decreasing temporary assurance.

SECTION C
Answer any TWO questions.   **(2 x 20 =40 marks)**

19. (a) Explain the various types of annuities and derive the expression for present value and accumulated value of a deferred annuity certain.
(b) A series of 8 annual sums of money is payable, the 1st payment is at the end of the 1st year. The first 5 payments are Rs. 300 each and the last 3 payments are Rs. 200 each. Find the present value and accumulated value of the 8 payments at 8 % p.a.

20. (a) Derive the expression for the present value and accumulated value of increasing annuity when the successive installments form an arithmetic progression.
(b) Jyothi deposits annually Rs. 200 p.a. for 10 years, the first deposit being made one year from now, and afer 1 years the annual deposit is enhanced to Rs. 300 p.a. Immediately after depositing the 15th payment she closes her account. What is the amount payable to her if interest is allowed at (a) 6 % p.a. (b) 9 % p.a.?

21. (a) Construct a table showing the expressions for loan outstanding, interest paid, repayment of principal for successive n level annual payments of Re. 1 each.
(b) Describe the method of construction of LIC tables.

22. Consider the particulars given in Problem 17 of Section B.
  (a) Calculate level annual premium for assurances ignoring interest and expenses.
    (i) A temporary assurance of Rs. 1000 for 2 years for a person aged 25.
    (ii) An endowment assurance of Rs. 1000 for 4 years for a person aged 25.
    (iii) A pure endowment of Rs. 600 for a person aged 27 payable at the end of 3 years.
  (b) Calculate the level annual premium at 6 % rate of interest.

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