



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – STATISTICS

FIFTH SEMESTER – NOVEMBER 2016

ST 5404 / ST 5406 - ACTUARIAL STATISTICS

Date: 09-11-2016
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

Section A

Answer ALL questions.

(10 x 2 = 20)

1. Define compound interest.
2. Differentiate between uniform annuity and variable annuity.
3. What are the various ways of redemption of loan?
4. What do you mean by a deferred perpetuity?
5. Define discount.
6. What are the two types of stochastic interest rates?
7. What is the use of mortality table?
8. What is the principle of insurance?
9. What is the difference between annual premium and installment premium?
10. Define Pure Endowment assurance.

Section B

Answer any FIVE questions.

(5 x 8 = 40)

11. Mr. A deposits annually Rs. 20,000 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. 30,000 p.a. immediately after depositing the 15th payment he closes the account. What is the amount payable to him if interest is calculated at 9% p.a.
12. Derive the expressions for effective rate of discount corresponding to nominal rate of discount and vice-versa.
13. In lieu of a single payment of Rs. 1000 at the present moment a person agrees to receive three 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 three payments?
14. Calculate the expected accumulated value at the end of 5 years of an initial investment of Rs. 50,000 if the returns from the investment are assumed to conform to the fixed interest rate model with the distribution of the following interest rates.

$$i_k = \begin{cases} 0.06 & \text{with probability } 0.2 \\ 0.08 & \text{with probability } 0.7 \\ 0.10 & \text{with probability } 0.1 \end{cases}$$

$k = 1, 2, 3, 4, 5.$

15. 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.1000 p.a. for the first five years and Rs. 2000 p.a. thereafter at 5% interest.

16. Fill up the blanks in the following portion of a life table:

Age x	I_x	d_x	q_x	p_x
10	1000000		0.00409	
11			0.00370	
12				0.99653
13				0.99658
14			0.00342	

17. Explain the columns of a mortality table and the probabilities of survival and death.

18. The following particulars are given:

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

Calculate allowing a rate of interest of interest of 6% p.a.

- The value of temporary assurance of Rs. 10,000 for 2 years for a person aged 25.
- The value of endowment assurance benefit of Rs. 10,000 for 4 years for a person aged 25.

Section C

Answer any TWO questions.

(2 x 20 = 40)

19. (a) Derive the expressions for present value and accumulated value of immediate increasing annuity.

(b) A series of 8 annual sums of money is payable, the first payment taking place at the end of one year from now. The first 5 payments are Rs. 3000 each and the last 3 payments are Rs. 2000 each. Find the present value and the accumulated value of the 8 payments at 8% p.a. (12 + 8)

20. A loan of Rs. 10,000/- is to be repaid with interest at 8% p.a. by means of an immediate annuity for 5 years. Find the level payment. Prepare a table showing the loan schedule. What will be the principal and interest contained in each of the 5 installments?

21. Explain S_n (accumulation of a single investment) and A_n (accumulation of a series of annual investments) in the context of stochastic interest rates and derive mean and variance of S_n and A_n .

22. (a) Find the probabilities that,

- a life aged 35 will die between the ages 45 and 50.
- a life aged 35 will not die between the ages 45 and 50.
- a life aged 35 will die in the 10th year from now.
- a life aged 35 will not die in the 10th year from now.

(b) Explain temporary assurance and endowment assurance and derive the expressions for their present values in terms of their commutation functions.

(8 + 12)
