LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **STATISTICS**

SECOND SEMESTER – **APRIL 2016**

ST 2961 – ACTUARIAL STATISTICS

Date: 27-04-2016 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

PART - A

Answer ALL questions. **(10x2=20 marks)**

1. Define accumulated value.
2. Define discount.
3. Define nominal rate of interest.
4. What is an immediate annuity?
5. Differentiate between uniform and variable annuity.
6. What is the principle of insurance?
7. What is meant by premium for an insured benefit?
8. What is the use of a mortality table?
9. Differentiate between temporary assurance and pure endowment assurance.
10. How do you get the present value of fixed term endowment (marriage) plan?

PART - B

Answer any FIVE questions. **(5x8=40 marks)**

11. Differentiate between effective and nominal rate of interest and derive the expressions for effective rate corresponding to nominal rate and vice-versa.
12. Explain in detail the probabilities for survival and death.
13. A loan of Rs. 1000 is to be repaid by payments of Rs 200 at the end of one year, Rs. 300 at the end of 2 years and the outstanding balance at the end of 4 years. What should the final payment be in interest is reckoned at 9% p.a. convertible half yearly?
14. Explain in detail the classification of annuities.
15. Using commutation functions based on LIC Ultimate mortality table at 6% interest calculate for a person aged 40.
    (i) The present value of whole life assurance of Rs.1,00,000.
    (ii) The present value of double endowment assurance of Rs.1,00,000 for 15 years term.
16. 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.
17. Derive expressions of present value of immediate perpetuity, perpetuity due, deferred immediate perpetuity and deferred perpetuity due.

18. 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	

PART - C

Answer any TWO questions. **(2x20=40 marks)**

19. (a) 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?

(b) Show that $(1+i)^t a_n = v^{n-t} s_n = s_t + a_{n-t}$. (10 + 10)

20. (a) Explain deferred annuities and derive expressions for present value and accumulated value of deferred annuities.

(b) A man wishes that Rs. 2,50,000/- be paid to his daughter after 10 years. A bank agrees to pay this for a lump sum invested now. If the rate of interest is 10% p.a. for first 3 years, 7.5% p.a. for second 3 years and 6.26% p.a. for the last 4 years, find the lump sum to be invested by the man. (10 + 10)

21. (a) 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 of interest being 10% p.a.

Find (i) the annual installment

(ii) the principal outstanding after the 6^{th} payment. (12 + 8)

22. Derive expressions for the present value for the following, using commutation functions,

(i) Temporary assurance

(ii) Whole life assurance

(iii) Endowment assurance

(iv) Pure endowment assurance.

$$$$$$$$