LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FOURTH SEMESTER – **NOVEMBER 2022**

UST 4601 – ACTUARIAL STATISTICS

Date: 03-12-2022   Dept. No.   Max. : 100 Marks
Time: 01:00 PM - 04:00 PM

Section A

Answer ALL the questions: **(10 X 2 = 20)**

1. Find the present value of Rs. 2000 receivable at the end of 30 years the rate of interest being 6% p.a.
2. Define immediate perpetuity, perpetuity due.
3. What are the uses of mortality table.
4. Evaluate $v^9 s_{13}7$ @ 9 %
5. Give the formula for present value of increasing annuity.
6. What is a varying interest rate model?
7. What is l_x and d_x in the mortality table?
8. Give the expression for e_x
9. Write the formula for the probability that a person aged x survives n years
10. Expand $\mathbf{S_x}$ in terms of $\mathbf{D_x}$

Section B

Answer ANY FIVE questions: **(5 X 8 = 40)**

11. 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 five payments are Rs 300 each and the last three payments are Rs. 200 each. Find the present value of eight payments @ 8% p.a.
12. A has taken a loan of Rs2000 at rate of interest 4% pa 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?
13. 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 ($a_5 = 4.3295$, $a_{10} = 7.7217$, $a_{15} = 10.3797$)
14. 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
15. 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.
16. Find the probability that of 2 persons A and B aged 30 and 35 respectively
        i.)   both die before 55.
        ii.)   both die after 60.

iii.) A dies before 65 while B dies after 60.

iv.) Atleast one of them survives to 70.

17 Explain in detail the probabilities of survival and death.

18 Calculate the net annual premiums for sum assured of Rs.5000 for the following assurances on (40)

(a) Pure endowment assurance for 20 years.

(b) Temporary assurance for 20 years

Section C

Answer ANY TWO questions: (2 X 20 = 40)

19 a) Find the present value of an immediate annuity of Rs.240 p.a payable in equal monthly installments for 10 years certain at nominal interest of 8% p.a convertible half yearly.   10

19 b) Derive an expression to find the present value for the following variable annuities: 10
    (i). Increasing annuity
    (ii). Immediate Increasing Perpetuity
    (iii). Increasing annuity due
    (iv). Increasing Perpetuity due

20 a) Fill up the blanks in the following portion of a life table: 10

Age X	l_x	d_x	q_x	p_x
10	1000000		0.00409	
11			0.00370	
12				0.99653
13				0.99658
14			0.00342	

20 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

21 A company consider that on average it will earn interest on it funds at the rate of 4% p.a. However, the investment policy is such that in any one year the yield on the company's funds is equally likely to take any value between 2% and 6%.   20

(i) Find the mean accumulation and variance of accumulation of single premium of Rs.1 with terms of 5, 10, 15, 20 and 25 year

(ii) Find the mean accumulation of annual premium of Rs.1 with terms of 5, 10, 15, 20 and 25 year

22 Explain Sn and An in the context of stochastic interest rates and derive mean and variance of Sn and An   20

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