



LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – STATISTICS

THIRD SEMESTER – APRIL 2025

PST3ME02 – ACTUARIAL STATISTICS



Date: 07-05-2025

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 PM

SECTION A – K1 (CO1)

Answer ALL the questions

(5 x 1 = 5)

1 Define the following

- Nominal rate of interest.
- Deferred immediate annuity certain.
- Stationary population.
- Whole life assurance.
- Net premium.

SECTION A – K2 (CO1)

Answer ALL the questions

(5 x 1 = 5)

2 Fill in the blanks

- The present value of a sum of money payable at some future date is also called the _____.
- If the payments are to be made during the life of a person it is called a _____.
- The probability that a person aged x dies within the next m years is denoted by _____.
- The benefit is payable only at the end of the selected term, whether the life assured is alive or not; this type of endowment is called a _____.
- The pure premiums increased by _____ are called office premiums.

SECTION B – K3 (CO2)

Answer any THREE of the following

(3 x 10 = 30)

- Find the accumulated value of the principal of Rs. 17,895 invested for 25 years at compound interest of 8% p.a.
 - Derive the effective rate corresponding to a nominal rate vice – versa.
- Derive an expression for finding the present value and accumulated value of an immediate annuity certain for n years.
 - A sum of money invested at 8% p.a. how long will take to quintuple itself.
- Calculate the present value of a deferred annuity payable for 18 years certain, the first payment falling due at the end of 7 years from the present time. The annuity is payable at the rate of Rs. 600 p.a. for the first 6 years and Rs.700 p.a. thereafter. ($i = 0.06$).
- Find the following probabilities
 - that a life aged 30 survives 10 years
 - that a life aged 30 dies within the next 10 years
 - that a life aged 30 dies after 10 years
- Write the short notes on level annual premium with illustrations.

SECTION C – K4 (CO3)

Answer any TWO of the following

(2 x 12.5 = 25)

- In settlement of a single payment Rs.30499 at the present moment Mr. Raja agrees to receive three equal payments at the end of 5 years, 7 years and 16 years respectively. Assuming a rate of interest of 7 %p.a. what should be the value of each of three payments?

9	a) Find the present value of Increasing annuity where in the successive instalment form a arithmetic progression. b) Under a settlement of property Mr. Kumar is entitled to receive Rs.1800 p.a. ad infinitum, the first payment being due at the end of 6 years. Find the present value of Mr. Kumar's right at 6% p.a.
10	A fund is to be set up out of which a payment of Rs. 100 will be made to each person who in any year qualifies for membership of a certain profession. Assuming that 10 persons will qualify at the end of one year from now, 15 at the end of 2 years, 20 at the end of 3 years, and so on till the number of qualifiers is 50 p.a, when it will remain constant, find at 5% per annum effective what sum must be paid into the fund now so that it may be sufficient to meet the outgo.
11	Of two persons A aged (35) and B aged (42), find the probabilities that a) A and B both survive 10 years b) A and B both die within 10 years c) One of the two survives 10 years while the other dies within that period d) At least one survives 10 years

SECTION D – K5 (CO4)

	Answer any ONE of the following (1 x 15 = 15)
12	a) A has taken loan of Rs 50963 at a rate of interest 8 % p.a. payable half yearly. He repaid Rs 11768 after 5 years, Rs 20321 after a further 8 years and clears all outstanding dues at the end of 17 years from the commencement of transaction. What was the final payment made by him? b) Derive a general formula for calculating the interest and principal portions of each installment in a loan repayment schedule.
13	a) Find the expression for present value and accumulated of a deferred annuity due for n years certain, the deferment period being m years. b) A person is entitled to Rs.200 after 3 years, another Rs.250 after a further period of 3 years and Rs.500 after a further period of 4 years. Find the present value of the payments if the rate of interest assumes are (i) 5% p.a. for the first 4 years (ii) 6% p.a. for the next 4 years, (iii) 7% p.a. for the next 2 years.

SECTION E – K6 (CO5)

	Answer any ONE of the following (1 x 20 = 20)
14	a) A bond of Rs. 1000 redeemable at par 10 years hence carries interest at the rate of 8% p.a. payable half yearly. (i) find the price which a purchaser of the bond must offer if he wishes to realize 9% p.a. on his investment. (ii) If the holder of a single bond invests the sums of interest on bond as they are received at rate of 9% p.a., find the total amount at the end of 10 years. b) Write short notes on Exposed to risk and graduation.
15	a) Find the present value and accumulated value of an immediate annuity for n years where payments of 'r' are made at each interval of 'r' years, n being an exact multiple of 'r' and the number of payments being n/r. b) Explain the use of Commutation functions D_X, C_X, M_X and R_X giving examples.

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