LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

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

THIRD SEMESTER – **NOVEMBER 2024**

PST3ME02 – ACTUARIAL STATISTICS

Date: 19-11-2024 Dept. No. Max. : 100 Marks

Time: 01:00 pm-04:00 pm

	SECTION A – K1 (CO1)	
	Answer ALL the questions	**(5 x 1 = 5)**
1	**Define the following**	
a)	Discounted value	
b)	Immediate annuity	
c)	Expectation of life	
d)	Pure endowment assurance	
e)	Office premium	
	SECTION A – K2 (CO1)	
	Answer ALL the questions	**(5 x 1 = 5)**
2	**Fill in the blanks**	
a)	The accumulated value is always _____the present value.	
b)	If all the payments are equal, then the annuity may be called_____.	
c)	Formula for the present value of Increasing annuity _____.	
d)	In stationary population, the total number of persons living at any time, who are aged x or more denoted by _____.	
e)	Endowment plan assurance is combination of _____and temporary assurance.	
	SECTION B – K3 (CO2)	
	Answer any THREE of the following	**(3 x 10 = 30)**
3	a) Find the accumulated value for the certain sum, the compound interest at a certain rate in 4 years and 5 years are Rs.24420 and Rs.25921 respectively. Find the rate and sum. b) Find the effective rate p.a. corresponding to the nominal rate 12 % p.a. convertible quarterly.	
4	a) A sum of Rs.60274 invested at rate of interest 7 %p.a. After 10 years the rate of interest is changed 7% p.a. convertible half yearly. After a further period of 5 years the rate was again changed to 8 % p.a. convertible quarterly. What is the accumulated value at the end of 22 years from commencement? b) Find the rate of discount corresponding to a rate of interest 0.10	
5	A series of 10 annual sums of money is payable, the first payment taking place at the end one year from now. The first seven payments are Rs. 600 each and last 3 payments are Rs.400 each. Find the present value of the ten payments @ 9% p.a.	
6	Find the probabilities that that a) a life aged 35 will die between the aged 45 and 50 b) a life aged 35 will not die between 45 and 50 c) a life aged 35 will die in the next 10^{th} year from now. d) a life aged 35 will not die in the 10^{th} year from now	
7	Derive the expression for present value of temporary assurance and whole life assurance in terms of assurance benefits in terms of commutation functions.	

	SECTION C – K4 (CO3)
	Answer any TWO of the following **(2 x 12.5 = 25)**
8	A person has purchased a bond of the face value of Rs. 57400 on which interest is payable yearly at 6% p.a. He received in all seven interest payments, the first one falling due one year after purchase. At the end of seven years the bond has matured for payment at par. If the person has realized an interest yield of 7 % p.a. in the transaction, what is the final purchase price?
9	Two loans of Rs.1000 each are made out to 'A', 6 years ago and 4 years ago respectively and an interest of 12% p.a. was agreed upon. A could only make a repayment of Rs. 800 at the present moment. He promises to clear the dues at the end of 4 years from now. How much will he have to pay then?
10	Derive and find the present value of an Increasing annuity and increasing annuity due.
11	Find the probabilities under mentioned cases a) Life aged 25 dies between ages 60 and 65 b) Of the two lives aged 25 and 30, at least one life dies before attaining age 70 c) Of three lives aged 40, 40, and 45 exactly two live survives 10 years d) Life aged 28 survives 12 years and dies in the 13^{th}, or 14^{th} year.
	SECTION D – K5 (CO4)
	Answer any ONE of the following **(1 x 15 = 15)**
12	a) Calculate the value at the end of $8\frac{1}{2}$ years of an annuity of Rs.280 p.a payable half yearly for 16 years certain, the rate of interest being taken as 8 % p.a convertible half yearly. Using all the three formulas. b) Derive relation between S_n and a_n
13	a) Derive and find the present value of increasing perpetuity and increasing perpetuity due. b) Of three persons A, B and C aged 40, 45 and 50 respectively find the probability that at least one of them will not die between the ages 65 and 70.
	SECTION E – K6 (CO5)
	Answer any ONE of the following **(1 x 20 = 20)**
14	a) A payment of Rs.600 falls due at the end of every three years. Find, at the rate of interest 6% p.a. the present value of 10 such payments spread over 30 years. b) A personal loan of Rs. 10,000 is taken at an 8% annual interest rate and is to be repaid over 5 years. What are the different methods for repaying the loan, and how is the repayment calculated for each method?
15	Briefly explain the methods for constructing a mortality table.

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