

**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

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

FIFTH SEMESTER – NOVEMBER 2007

**ST 5404 - ACTUARIAL STATISTICS**

BB 17

Date : 03/11/2007  
Time : 9:00 - 12:00

Dept. No.

Max. : 100 Marks

**PART - A**

**Answer all questions :**

**10 x 2 = 20**

1. Define immediate annuity and annuity due.
2. What is the relation between  $S_n$  and  $a_n$  ?
3. What is the value of  $a_\infty$  and  $\ddot{a}_\infty$  ?
4. Write the formula for  ${}_n P_x$ ,  $m|n q_x$
5. Write the formula for principal and interest in the  $m$ th instalment of a level annual payment
6. Find the effective rate  $p.a$  corresponding to the nominal rate of 8% convertible half yearly.
7. Write the formula for  $a_{x:n}$ .
8. What is the principle of life insurance?
9. A national savings certificate gives Rs.1901 after 6 years for investing Rs.1000. What is the interest rate?
10. Explain Endowment assurance.

**PART - B**

**Answer 5 questions :**

**5 x 8 = 40**

11. Derive the formula for present value and Accumulated value of an immediate annuity for  $n$  years.
12. Derive the formula for  $(Ia)_n$ .
13. A loan of Rs.1000 to be repaid by payments of Rs.200 at the end of 1 year, Rs.300 at the end of two years and the outstanding balance at the end of  $4\frac{1}{2}$  years. What should the final payment be if interest is reckoned at 9%  $pa$ ?
14. Derive the formula for present value and accumulated value if the payment is done  $p$  times a year and the yearly interest rate is given for  $n$  years. The first payment is paid after the first period.
15. Derive the formula for  $A_{x:n}$ ,  $A_x$
16. Find the present value of an immediate annuity certain of Rs.1000  $pa$  for 20 years, if the rate of interest is 8%  $pa$  for first 12 years and 6%  $pa$  thereafter.
17. Write down the probabilities of the following in terms of  $l_x$ .
  - a) life aged 25 dies between 60 and 65.
  - b) of the two lives aged 25 and 30 atleast one dies before attaining age 70.
  - c) of the three lives aged 35, 40 and 45 exactly 2 lives survives 10 years.
18. Calculate the net annual premium for sum assured of Rs.5000 for the following assurances on a person with age 40.
  - a) pure endowment assurance for 20 years
  - b) Temporary assurance for 20 years.

**PART - C**

*Answer 2 questions.*

*2 x 20 = 40*

19. a) Explain the terms in the life table.  
b) An employee of an institution has to retire at age 58. A gratuity benefit of one month's salary for each year of service subject to a maximum benefit of 15 months salary is payable to an employee on retirement or death as the case may be. Find the probability that
- full gratuity benefit will be payable to a person aged 40, who has just now completed 5 years of service.
  - Gratuity benefit will not exceed 10 months salary.
  - Gratuity benefit will be atleast 12 months salary.
  - the employee earns atleast 12 months salary as a gratuity benefit payable on death.
20. a) Provident fund deductions are made monthly at a rate of Rs.200 per month and credited to PF account. Find the accumulated value at end of 10 years, at 10% p.a. Also obtain the present value.  
b) A loan of Rs.3000 is to be repaid with interest at 6% pa by means of an immediate annuity for 10 years. Find the installment. What will be outstanding principal after the 8<sup>th</sup> payment.
21. On the basis of the LIC (1970-73) table at 6% calculate the net annual premiums for a sum assured of Rs.1000 for the following assurances on (30):
- Whole life assurance
  - Whole life assurance, premium limited to 20 years.
  - Endowment assurance for 25 years.
  - Endowment assurance for 25 years, premium limited to 15 years.
  - Defined temporary assurance the assurance to commence at age 35 and than to continue for 10 years.
22. Write short notes on any 3 of the following.
- Deferred annuity.
  - Increasing temporary assurance.
  - Life annuities.
  - Effective rate, nominal rate, discount.

\*\*\*\*\*