LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – APRIL 2010

ST 5404 - ACTUARIAL STATISTICS

Date & Time: 27/04/2010 / 9:00 - 12:00 Dept. No. | | Max. : 100 Marks

SECTION A

Answer ALL questions. **(10 x 2 =20 marks)**

1. Suppose if Rs. 100 is deposited in a savings account, show the accumulated amount after 20 years and 40 years if compound interest is paid at 8 % p.a.
2. What is discounting?
3. What is the effective rate p.a. corresponding to a nominal rate of 12 % p.a. convertible monthly?
4. Find the accumulated value at the end of 12 years of an amount of Rs. 750 invested at 9 % p.a. for the first 6 years ad thereafter at 10 % p.a. convertible half-yearly for the last 6 years.
5. What are deferred annuities?
6. Given how will you find and, given how will you find?
7. Show that
8. What is perpetuity?
9. Find the probability that a life ages 30 survives 10 years using LIC Ultimate Tables.
10. What is a Whole Life Assurance?

SECTION B

Answer any FIVE questions. **(5 x 8 =40 marks)**

11. The accumulated values for a certain sum with interest at a certain rate in 2 years and in 3 years are Rs. 8820 and Rs. 9261 respectively. Find the rate of interest and the sum.

12. A has taken a loan of Rs. 2000 at a rate of interest 4% p.a. 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. Derive the expression for the present value and accumulated value of an increasing annuity.

14. 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 being 10 % p.a. Find
- **a.** the annual installment
- **b.** the interest contained in the 6^{th} payment
- **c.** the principal outstanding after the 6^{th} payment

15. Find the probabilities that
- **a.** a life aged 35 will die between the ages 45 and 50
- **b.** a life aged 35 will not die between the ages 45 and 50
- **c.** a life aged 35 will die in the 10^{th} year from now
- **d.** life aged 35 will not die in the 10^{th} year from now

16. What is the principle of insurance? How has endowment type assurance emerged?

17. 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.

18. Derive the expressions for present value and accumulated value of an immediate annuity of Re. 1 p.a. for a term of 1 years under which payments are made p times a year, the rate of interest being i p.a.

SECTION C

Answer any TWO questions. **(2 x 20 =40 marks)**

19. (**i)** Derive the expression to convert effective rate of interest to nominal rate and vice-versa.

(i) Find the present value of Rs 1000 due 10 years hence at nominal rate of interest of 6% p.a. convertible monthly.

(ii) Which yields a higher rate of interest – a fixed deposit in a bank which gives Rs. 1629 after 5 years foe every Rs, 1000 deposited, or a National Savings Certificate which gives Rs. 1901 after 6 years for Rs. 1000?

20. Explain the various types of annuities and derive the expressions for present value and accumulated value of an immediate annuity certain and deferred annuity certain.

21. (i) Gokul had decided to invest Rs, 5000 at the end of each year. He did so for 7 years, and then there was a gap of 4 years. He could again invest Rs, 5000 p.a. for the next 4 years beginning from the end of the 12^{th} year. Find the amount to his credit at the end of the 15^{th} year assuming interest at effective rate of 9 % p.a.

(ii) A loan of Rs. 3000 is to be repaid with interest at 6% p.a. by means of an immediate annuity for 10 years.

(a) Find the level annual payment.

(b) What will be the interest and principal contained in the 5^{th} installment?

(c) What will be the principal outstanding immediately after the 8^{th} payment is made?

22. (i) What is the use of a mortality table? Explain the various functions in LIC Ultimate table. Show that given any one function, the other functions can be derived there from.

(ii) Of two persons Ashish aged 35 and Ruban ages 42, find the probability that

(a) Ashish and Ruban both survive 10 years.

(b) Ashish and Ruban both die within 10 years

(c) One of the two lives 10 years while the other dies within that period.

(iii) Using LIC Ultimate Tables.