



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – STATISTICS

SECOND SEMESTER – APRIL 2014

ST 2961 - ACTUARIAL STATISTICS

Date : 08/04/2014
Time : 09:00-12:00

Dept. No.

Max. : 100 Marks

Section – A
(Answer all the questions) (10 x 2 = 20)

1. The accumulated value of a certain principal at 9% p.a. is Rs.14897. Find the principal if the time is 4 years.
2. Give the formula for nominal rate of interest given the effective rate of interest.
3. Compute the present value of Rs.34516 due 15 years hence at a rate of discount 8% p.a.
4. What is the present value of Rs.12803 due at the end of 20 years, the rate of interest 5% for the first 6 years from now and 8% convertible half yearly for the next 8 years.
5. Evaluate $(1 + i)^{12} a_{16}$
6. Find the present value of an immediate annuity of Rs.120 p.a. payable quarterly for 12 years at rate of interest 7% p.a. convertible half yearly.
7. Give the formula for m_x and q_x in central death rate.
8. Provide the expression for ${}_{15}P_{48}$ and ${}_{12}Q_{63}$
9. Write the formula for $(\ddot{a})_x$ and $(Ia)_{x:n}$
10. Write the expression for P_x and $P_{x:n}$

Section – B
(Answer any five questions) (5 x 8 = 40)

11. a) Find the accumulated value of series of 12 annual sums of money payable, the first payment taking place at the end of the one year from now. The first 8 payments are Rs 900 and each and last four payments are Rs.400 each. ($i = 0.09$ p.a.)

b) Ram promised to pay Sam a sum of Rs.1200 at the end of 8 years and another Rs.1600 at the end of 12 years from now. What is the immediate cash payment should Sam accept in agreement of the above payments, if interest is reckoned at 7% p.a.? (5+3)
12. Two loans of 1000 each are made out to Raja six years ago and four years ago respectively and an interest of 12% p.a. was agreed upon. Sam 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?
13. Arul has taken a loan of Rs. 15,300 at the rate of interest 10% p.a. payable half yearly. He repaid Rs.1500 after 10 years, Rs. 4800 after a further period of 8 years and cleared all outstanding dues at the end of 26 years from the commencement of the transaction. What is the final payment made by him?

14. a) A person aged 28 has contributed Rs.2800 to his provident fund during the current month, what will this particular contribution amount to by the time he retires at age 58, assuming rate of interest 9% p.a.?

b) Under a education endowment policy for Rs.2,50,000 the sum assured is payable at the end of the fixed term chosen. A claim for a policy of Rs.2,50,000 has occurred 17 years before the end of the fixed term and the claimant requests for immediate cash payment. Assume the company entertains such requests, what is the sum payable if interest is reckoned at

(i) 10%

(ii) 12%

(iii) 14%

(3+5)

15. Calculate the present value of a deferred annuity payable for 30 years certain, the first payment falling due at the end of 10 years from the present time. The annuity is payable Rs.780 p.a. first 20 years and Rs. 900 p.a. thereafter.($i = 0.07$)

16. Find the probabilities that

a) a life aged 48 will die between age 50 and 55

b) a life aged 48 will not die between age 50 and 55

c) a life aged 48 will die in the 12 year from now

d) a life aged 48 will not die in the 12th year from now.

17. Describe Pure Endowment Assurance and Increasing Temporary Assurance.

18. Derive the formula for $a_{x:n}$ and $\ddot{a}_{x:n}$

Section – C

(Answer any two questions)

(2 x 20 =40)

19. a)Suresh has purchased a bond of the face value of Rs.68, 700 on which interest is payable yearly at 5% p.a. He received in all 10 interest payments the first one falling due one year after purchase. At the end of 10 years the bond has matured for payments at par. If he has realized an interest yield of 6% p.a. in the transaction, what is the purchase price?

b) Derive the relationship between S_n and a_n

(10+10)

20. a)A particular finance company fund is to be set up out of which a payment of Rs.500 will be made to each person who in any year qualifies for membership of a certain profession. Assuming that 20 person will qualify at the end of one year from now, 25 at the end 2 years, 30 at the end of 3 years, and so on till the number of qualifiers is 70 per annum., when it will remain constant, find at 8% p.a. effective what sum must be paid into the fund now that it may be sufficient to meet the outgo.

b) Find the present value and accumulated value of an immediate annuity of 1p.a. for term n years under which payments are made p times a year, the rate of interest being i p.a.

(10+10)

21. a) Ram aged (50) and Bala aged (57), find the probability that

- i) Ram and Bala both survive 12 years
- ii) Ram and Bala both die within 12 years
- iii) One of the two lives survives 12 years while other dies within that period
- iv) At least one survives 10 years.

b) Find the probability for the following

- i) Life aged 30 dies between ages 50 and 55,
- ii) Of the two lives aged 30 and 35, at least one life dies before attaining age 60.
- iii) Of three lives aged 45, 45 and 50 exactly two lives survives 15 years.
- iv) Life aged 33 survives 15 years and dies 16th or 17th year. (10+10)

22. a) Derive the expression for commutation functions D_x , C_x , M_x and R_x and give an example.

b) On the basis of the LIC (1970-73) Ultimate table 6%, Calculate the net annual premiums for a sum assured of Rs.1560 for the following assurance on (40):

- i) Whole Life Assurance
- ii) Whole Life Assurance, premiums limited to 25 years
- iii) Endowment Assurance for 30 years.
- iv) Endowment Assurance for 30 years, premiums limited to 20 years.

Deferred Temporary Assurance – the assurance to commence at 40 and then continue to 15 years.

(8+12)