LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FOURTH SEMESTER – **APRIL 2024**

UST 4601 – ACTUARIAL STATISTICS

Date: 25-04-2024 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

PART – A

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

1. Find the accumulated value of principal of Rs350 invested for 10 years at compound interest of 6% p.a.
2. Find the present value at rate of interest 6% p.a. of Rs.500 payable 5 years hence.
3. Calculate the effective rate p.a. corresponding to the nominal rate of 8% p.a. convertible quarterly.
4. Define discount and discounted value.
5. Define immediate annuity.
6. What is deferment period?
7. Write the formula to find the present value of an increasing perpetuity due
8. Define office premium.
9. What is natural premium?
10. Define Stochastic interest rate.

PART – B

Answer any FOUR questions **(4 x 10 = 40 marks)**

11. Derive an expression for finding effective rate of interest to the nominal rate of interest vice versa.
12. In settlement of a single payment Rs.2000 at the present moment Mr. Raja agrees to receive three equal payments at the end of 3 years, 6 years and 10 years respectively. Assuming a rate of interest of 6 %p.a. what should be the value each of three payments?
13. Arun 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 rates of interest assume d 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.
14. Two loans of 500 each are made out to Sam six years ago and four years ago respectively and an interest of 6% p.a. was agreed upon. Sam could only make a repayment of Rs.400 at the present moment. He promises to clear the dues at the end of 2 years from now. How much will he have to pay then?
15. Derive the formula for present value and accumulated value of annuity due.
16. Derive an expression to find the present value of immediate increasing annuity.
17. What is meant by premium for an insured benefit and how it is usually arrived at?
18. Explain natural premium with illustrations.

PART – C

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

19. a) 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.200 p.a. for the first 5 years and Rs.300 p.a. thereafter. (i = 0.05).

    b) Derive the formula for present value and accumulated value of deferred annuity certain.

20. a) Find the value as at the end $5\frac{1}{2}$ years of an annuity of Rs.200 p.a payable half yearly for 10 years certain, the rate of interest being taken as 6 % p.a. convertible half yearly. (using all the three formula)

    b) Derive the relation between $i^{(m)}$ and $d^{(m)}$

21. a) 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.

    b) Find the office annual premium for capital redemption assurance policy of Rs.3000 redeemable at the end of 20 years, assuming interest rate of 6% p.a. and loading of 8% of office premium.

22. a) Discuss advantages and disadvantages of level premium and term premium

    b) Find the present value and accumulated value of an immediate annuity for n years where payments r are at each interval of r years, n being an exact multiple of r and the number of payments being n/r.

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