LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – STATISTICS

FIFTH SEMESTER – NOVEMBER 2009

ST 5404 - ACTUARIAL STATISTICS

Date & Time: 12/11/2009 / 9:00 - 12:00   Dept. No.   Max. : 100 Marks

SECTION A

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

1. Find the accumulated value of principal of Rs. 250 invested for 10 years at the rate of interest of 6 % p.a.
2. Differentiate between nominal and effective rate of interest.
3. Find the present value at rate of interest of 6% p.a. of Rs. 300 payable 5 years hence.
4. Define an annuity.
5. Show that
6. Find the accumulated value of an 8 year annuity of Re. 1 at the end of 5 years at the rate of interest of 7 % p.a.
7. Find the value of
8. What is the need for a mortality table in a life insurance office?
9. Find the probability that a life aged 30 dies within the next 10 years.
10. What is a pure endowment assurance?

SECTION B

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

11. Find the accumulated value of Rs. 1000 at the end of 10 years:
    - **(i)**   at nominal rate of interest of 12 % p.a. convertible quarterly
    - **(ii)**   at effective rate of interest of 3 % per half year.

12. A loan of Rs. 1000 is to be repaid by payments of Rs. 200 at the end of 1 year. Rs. 300 at the end of 2 years and the outstanding balance at the end of 4 ½ years. What should the final payment be if interest in reckoned at 9 % p.a. convertible half-yearly?

13. The cash purchase price of a bike is Rs. 10,000. A company however offers instalment plan where under an immediate payment of Rs. 2000 is to be made and a series of 5 equal half-yearly payments made thereafter, the first installment being payable at the end of 6 months. If the company wishes to realize a rate of interest of 12 % convertible half-yearly in the transaction, calculate the half-yearly instalment.

14. What are the common ways by which a loan can be repaid? Discuss the uniform yearly payment method giving a suitable example.

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15. Using the LIC ultimate table find the following probabilities:
- **(i)** a life aged 35 dies within 12 years.
- **(ii)** a life aged 40 dies not earlier than 12 years and not later than 15 years.
- **(iii)** a life aged 2 survives 12 years
- **(iv)** a life aged 52 will not die between ages 65 and 70.

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

17. An annuity is payable for 15 years certain, the first payment falling due at the end of the first year. The annuity is payable at the rate of Rs. 500 p.a. during the first 10 years and at Rs. 300 p.a. for the remaining 5 years. Calculate the present value of the annuity on the basis of interest at 4% p.a.

18. Find the expressions for the present value and accumulated value of an immediate annuity of Re. 1 p.a. for a term of n 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 expressions for present value and accumulated value of an immediate annuity certain. Also derive an expression showing the relationship between   and   .
(ii) Jagadeesh has invested Rs. 1,00,000 in National Defense Savings Certificate. After 15 years he is entitled to receive Rs. 1,75,000. What rate of interest is realized in the transaction?

20. (i) A sum of Rs. 20,000 is invested at a rate of interest of 5 % p.a. After 7 years, the rate of interest was changed to 5 % p.a. convertible half-yearly. After a further period of 3 years, the rate was again changed to 6 % p.a. convertible quarterly. What is the accumulated value at the end of 15 years from commencement?
 (ii) In lieu of a single payment of Rs. 1000, at the present moment a person agrees to receive 3 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 of each of the 3 payments?

21. Explain in detail the steps in the construction of a life table.

22. (i) Explain selection, select rates and period of selection
(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.

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