



Subject: Financial
Mathematics

Chapter: 1,2,3,4 (Unit 1&2)

Category: Assignment 1
Questions

1. The nominal rate of discount per annum convertible quarterly is 8%.
 - i) Calculate the equivalent force of interest.
 - ii) Calculate the equivalent effective rate of interest per annum.
 - iii) Calculate the equivalent nominal rate of discount per annum convertible monthly.

2. The force of interest $\delta(t) = 0.004t + 0.0002t^2$ for all t
 - i) Find Present value of sum of rupees 1000 payable at the end of 10 years from now
 - ii) Find constant annual effective rate of interest over a 10 year period

3. i) Explain the relationship $d = iv$ by general reasoning where d is the effective annual rate of discount and i is the effective annual rate of interest.
 - ii) Calculate nominal rate of discount per annum convertible half yearly which is equivalent to
 - (a) An effective rate of discount of 2.25% per quarter
 - (b) A nominal rate of discount of 5% convertible every 2 years.
 - iii) A 91-day government bill provides the investor with an annual effective rate of return of 5%. Calculate the annual simple discount rate at which the bill is discounted.

4. i) Explain the relationship $d = iv$ by general reasoning where d is the effective annual rate of discount and i is the effective annual rate of interest.
 - ii) Given $i = 0.08$, Calculate
 - a. $d^{(12)}$
 - b. $i^{(365)}$
 - c. δ
 - d. $i^{(0.5)}$

5. i) The rate of discount per annum convertible quarterly is 6%. Calculate:
- The equivalent rate of interest per annum convertible half yearly.
 - The equivalent rate of discount per annum convertible monthly.
- ii) On 15th April, 2005 Amit borrowed Rs.2,00,000 to be repaid one year later by single payment of Rs.2,20,000. Amit repaid the loan early on 17th July, 2005.
- Find the sum paid by Amit to terminate the contract assuming that the interest is reduced proportionately for early settlement.
6. i) The manufacturer of a certain toy sells to retailers on either of the following terms:
- Cash payment: 30% below the recommended retail price
 - Six months credit: 25% below the recommended retail price.
- Find the effective annual rate of discount offered by the manufacturer to the retailers who pay cash as opposed to those retailers who accept the credit terms
- ii) Find $d^{(12)}$, $i^{(2)}$ and δ
7. If an investment fund offers to increase INR 20,000 to INR 26,000 in 17 months, calculate the following:
- The nominal rate of interest per annum convertible quarterly
 - The nominal rate of discount per annum convertible half yearly
 - Simple rate of interest per annum
 - Comment on the results
8. Explain with the help of a graph, for an effective interest rate of 8% p.a, the relationship between equivalent nominal rates of interest convertible pthly ($i^{(p)}$) and p.

9. i) Define force of interest.

ii) If $i^{(2)} = 0.0775$

Calculate i , δ , $d^{(12)}$, $i^{(1/2)}$.

10. $\delta(t)$ the force of interest per annum at time t years is defined as:-

$$\delta(t) = \begin{cases} 0.08 & \text{for } 0 \leq t \leq 5 \\ 0.06 & \text{for } 5 \leq t \leq 10 \\ 0.04 & \text{for } t \geq 10 \end{cases}$$

Using $\delta(t)$, Derive the expression for $v(t)$, the present value of 1 due at time t .

11. a) A 9-month loan, repayable by a single payment of 50,000 is issued at a rate of commercial discount of 18% p.a. What amount was initially lent to the borrower?

b)

i. If $\delta = 6\%$, find $d^{(12)}$

ii. If $d = 6\%$, find $i^{(12)}$

c) Arrange the following quantities in ascending order of numerical value, giving brief reasons for the order assuming that they all correspond to same effective interest rate: i , d , $i(4)$, δ

d) Explain in words why the relationship $d = iv$ holds true.

12. a) A deposit of 7,049 is accumulated at the following rates of interest: 6% per annum nominal convertible monthly for first two years followed by 1.5% per quarter simple for next two and a half years followed by a rate of discount of 6% per annum convertible monthly for next one and a half years. Calculate the accumulated amount after 6 years.

13. Calculate the time in years for an investment to double at:

i) An effective rate of interest of 10% p.a.

ii) A nominal discount rate of 10% p.a. convertible monthly.