

PERPETUITY, SINKING FUNDS & EMI

1 MARK QUESTIONS

1. The present value of a sequence of Rs 100 made at the end of every year and continuing forever, if the money is worth 5% compounded annually, is
(A) Rs 2000 (B) Rs 20000 (C) Rs 5000 (D) 12000
[March, 2025]
2. Using flat rate method, the EMI to repay a loan of Rs. 20,000 in 2.5 years at an interest rate of 8% p.a. is :
(A) Rs. 700 (B) Rs. 800 (C) Rs. 900 (D) Rs. 100
[March, 2024]
3. What sum of money should be deposited at the end of every 6 months to accumulate Rs 50,000 in 8 years, if money is worth 6% p.a. compounded semi-annually ? [Given : $(1.03)^{16} = 1.6047$]
(A) Rs. 3,432.53 (B) Rs. 2,783.08 (C) Rs. 2,480.57 (D) Rs. 2,149.93
[March, 2024]
4. The present value of a perpetuity of Rs. R payable at the end of each payment period, when the money is worth i per period, is given by :
(A) Ri (B) $R + \frac{R}{i}$ (C) $\frac{R}{i}$ (D) $R - Ri$
[March, 2023]
5. Using flat rate method, the EMI to repay a loan of Rs. 20,000 in 2.5 years at an interest rate of 8% p.a. is :
(A) Rs. 700 (B) Rs. 800 (C) Rs. 900 (D) Rs. 100
[July, 2025]
6. At what rate of interest will the present value of a perpetuity of ₹ 500 payable at the end of each quarter be ₹ 40,000 ?
(A) 1.25% p.a. (B) 2.5% p.a. (C) 5% p.a. (D) 6% p.a.
[July, 2024]
7. For the annual payment R to remain the same in case the interest rate decreases from 6% to 4%, the present value of a perpetuity
(A) will decrease (B) will remain the same
(C) will increase (D) will no longer be valid
[SQP 25-26]
8. At what rate of interest will the present value of a perpetuity of ₹ 500 payable at the end of each quarter be ₹ 40000?
(A) 1.25 % p.a. (B) 2.5 % p.a. (C) 5 % p.a. (D) 6 % p.a.
[SQP 25-26]
9. Using flat rate method, the EMI to repay a loan of ₹ 20000 in 2.5 years at an interest rate of 8 % p.a. is
(A) ₹ 700 (B) ₹ 800 (C) ₹ 90 (D) ₹ 100
[SQP 25-26]
10. The present value of a sequence of payments of ₹ 800 made at the end of every 6 month and continuing forever. If money is worth 4% per annum compounded semi-annually, then the present value of the sequence is:
(A) ₹ 20000 (B) ₹ 40000 (C) ₹ 60000 (D) ₹ 80000
[SQP 24-25]

11. If the cash equivalent of a perpetuity of Rs 300 payable at the end of each quarter is 24000 then rate of interest compounded quarterly is
 (a) 5% (b) 4% (c) 3% (d) 2% [SQP 23-24]
12. What is the face value of a sinking fund that yields a dividend of ₹1800 at 10% semi-annually?
 a) ₹ 3600 b) ₹18000 c) ₹ 24000 d) ₹ 36000 [SQP 22-23]

2 MARKS QUESTIONS

13. At 6% p.a., compounded quarterly, find the present value of a perpetuity of Rs 600 payable at the end of each quarter. [March, 2024]
14. Find the present value of a perpetuity of Rs. 18,000 payable at the end of 6 months, if the money is worth 8% p.a. compounded semi-annually. [March, 2022]
15. Find the present value of a perpetuity of ₹ 4,200 payable at the beginning of each year, if money is worth 5% compounded annually. [July, 2025]
16. Find the present value of a perpetuity of ₹ 5,000 payable at the end of each year, if money is worth 5% compounded annually. [July, 2025]
17. A man borrows Rs. 3,00,000 at 6% per annum compounded interest and promises to pay off the debt in 20 instalments beginning at the end of the first year. Find the amount of annual instalment. [Given: $(1.06)^{-20} = 0.312$] [July, 2022]
18. Find the present value of perpetuity of ₹600 at end of each quarter if money is worth 8% compounded quarterly. [SQP 21-22]
19. Find the present value of an annuity of ₹1000 payable at the end of each year for 5 years if money is worth 6% compounded annually. [Given $(1.06)^{-5} = 0.7473$] [SQP 21-22]

3 MARKS QUESTIONS

20. Calculate EMI under flat-rate system for a loan of Rs 5,00,000 with 7.5% annual interest rate for 5 years. [March, 2025]
21. A machine costs Rs 1,00,000 and its effective life is estimated to be 12 years. A sinking fund is created for replacing the machine by a new model at the end of its life time when its scrap realizes a sum of Rs 5,000 only. Find what amount should be set aside at the end of each year, out of the profits for the sinking fund if it accumulates at 5% effective. [Use $(1.05)^{12} = 1.7958$] [March, 2025]
22. Amrita bought a car worth Rs. 12,50,000 and makes a down payment of Rs. 3,00,000. The balance amount is to be paid in 4 years by equal monthly instalments at an interest rate of 15% p.a. Find the EMI that Amrita has to pay for the car. {Given $(1.0125)^{-48} = 0.5508565$ } [March, 2023]
23. Madhu exchanged her old car valued at < 1,50,000 with a new one priced at Rs. 6,50,000. She paid Rs. x as down payment and the balance in 20 monthly equal instalments of Rs. 21,000 each. The rate of interest offered to her is 9% p.a. Find the value of x. [Given that : $(1.0075)^{-20} = 0.86118985$] [March, 2022]

24. A machine costing ₹ 2,00,000 has effective life of 7 years and its scrap value is ₹ 30,000. What amount should the company put into a sinking fund earning 5% p.a. so that it can replace the machine after its useful life ? Assume that a new machine will cost ₹ 3,00,000 after 7 years.
[Given : $(1.05)^7 = 1.407$]
[July, 2024]
25. A company purchases a machine for ₹ 50,000. The machine is expected to be used for 8 years, and its scrap value at the end of this period is estimated to be ₹ 6,000. A sinking fund is set up for replacing the machine with a new one after 8 years, which is expected to cost 30% more than the current machine. The sinking fund earns 6% interest per annum, compounded annually. Calculate the yearly payment required to be put in the sinking fund. [Use $(1.06)^8 = 1.6$]
[SQP 25-26]
26. At what rate of interest will the present value of perpetuity of 1500 payable at the end of every 6 months be 20,000?
[SQP 23-24]
27. Mr Surya borrowed a sum of 5,00,000 with total interest to be paid 2,00,000(flat) and he is paying an EMI of 12,500. Calculate loan tenure.
[SQP 23-24]
28. Mr Sharma wants to send his daughter abroad for higher studies after 10 years. He sets up a sinking fund in order to have 500,000 after 10 years. How much should he set aside semi-annually into an account paying 5% per annum compounded annually. [Use $(1.025)^{20} = 1.6386$]
[SQP 23-24]
29. Surjeet purchased a new house, costing ₹ 40,00,000 and made a certain amount of down payment so that he can pay the balance by taking a home loan from XYZ Bank. If his equated monthly instalment is ₹ 30,000, at 9% interest compounded monthly (reducing balance method) and payable for 25 years, then what is the initial down payment made by him? [Use $(1.0075)^{-300} = 0.1062$]
[SQP 22-23]
30. 10 years ago, Mr Mehra set up a sinking fund to save for his daughter's higher studies. At the end of 10 years, he has received an amount of ₹ 10,21,760. What amount did he put in the sinking fund at the end of every 6 months for the tenure, which paid him 5% p.a. compounded semi-annually? [Use $(1.025)^{20} = 1.6386$]
[SQP 22-23]

5 MARKS QUESTIONS

31. Amrita buys a car for which she makes a down payment of Rs. 2,50,000 and the balance is to be paid in 2 years by monthly instalments of Rs. 25,448 each. If the financier charges interest at the rate of 20% p.a, find the actual price of the car. [Given $\left(\frac{61}{60}\right)^{-24} = 0.67253$]
[March, 2024]
32. A machine costs a company ₹ 52,000 and its effective life is estimated to be 25 years. A sinking fund is created for replacing the machine by a new model at the end of its life time, when its scrap realizes a sum of ₹ 2,500 only. The price of the new model is estimated to be 25% more than the price of the present one. Find what amount should be set aside at the end of each year out of the profits for the sinking fund, if it accumulates at 3.5% per annum compound. [Given $(1.035)^{25} = 2.3632$]
[July, 2025]
33. Mahesh purchased a house from a company for ₹ 70,00,000 and made a down payment of ₹ 15,00,000. He repays the balance in 25 years by monthly instalments at 9% p.a. compounded monthly.
(i) What is the amount of monthly payment ?

(ii) What is the total interest payment ? [Given : $(1.0075)^{-300} = 0.1062878338$]

[July, 2024]

34. A company establishes a sinking fund to provide for the payment of Rs 1,00,000 debt, maturing in 4 years. Contributions to the fund are to be made at the end of year. Find the amount of each annual

deposit if interest is 18% per annum. [Use $(1.18)^4 = 1.9388$]

[July, 2023]

35. A person takes a housing loan worth < 10,00,000 at an interest rate of 6% p.a compounded monthly. He decided to repay the loan by equal monthly instalments in 15 years. Calculate the EMI, using

(i) flat rate method,

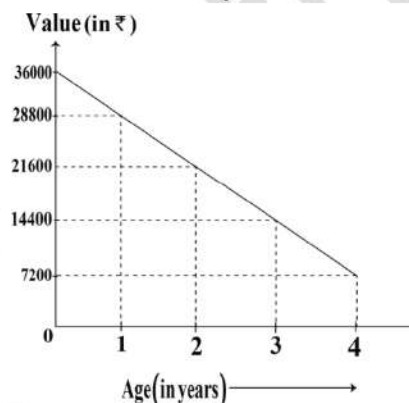
(ii) reducing balance method. [Given : $(1.005)^{-180} = 0.4074824$]

[July, 2023]

36. Mr. Sharma plans to buy a car worth ₹10,00,000. He makes a down payment of 20% of the car price and takes a loan for the remaining amount. The loan is to be repaid in 5 years with an annual interest rate of 10%, compounded monthly. Calculate the monthly EMI using the reducing balance method and the total interest paid over the loan period. [Use $(1.0083)^{60} = 1.64$]

[SQP 25-26]

37. In 4 years, a mobile costing ₹ 36,000 will have a salvage value of ₹ 7200. The following graph shows the depreciation of a mobile's value over 4 years.



A new mobile at that time (i.e., after 4 years) is expected to cost for ₹ 55,200. In order to provide funds for the difference between the replacement cost and the salvage cost, a sinking fund is set up into which equal payments are placed at the end of each year. If the fund earns interest at the rate 7% compounded annually, how much should each payment be? Also find the amount of Annual Depreciation of the mobile's value over 4 years and find the rate of depreciation (under straight line method). [Use $(1.07)^4 = 1.3107$]

[SQP 24-25]

CASE BASED QUESTIONS

38. Ramesh borrowed a home loan amount of Rs 7,00,000 from a bank at an interest of 12% per annum for 30 years, to be paid in monthly instalments.

Based on above information, answer the following questions:

- (i) Write the formula for calculating EMI by reducing balance method.
(ii) Write the values of P, i and n respectively.
(iii) Find the EMI. [use $(1.01)^{-360} = 0.02781668$]

OR

- (iii) If the loan is to be returned in 20 years, find EMI. [use $(1.01)^{-240} = 0.09180584$]

[March, 2025]

39. In the year 2010, Mr. Aggarwal took a home loan of Rs. 30,00,000 from State Bank of India at 7.5% p.a. compounded monthly for 20 years.

Based on the above information, answer the following questions :

- (i) Determine the EMI.
- (ii) Find the principal paid by Mr. Aggarwal in the 150th instalment.
- (iii) (a) Find the total interest paid by Mr. Aggarwal.

OR

- (iii) (b) How much was paid by Mr. Aggarwal to repay the entire amount of home loan ?

[Use $(1.00625)^{240} = 4.4608$; $(1.00625)^{91} = 1.7629$]

[March, 2023]

40. A machine costing Rs. 2,00,000 has effective life of 7 years and its scrap value is Rs. 30,000. What amount should the company put into a sinking fund earning 5% p.a., so that it can replace the machine after its usual life ? Assume that a new machine will cost Rs 3,00,000 after 7 years.

[Given that : $(1.05)^7 = 1.407$]

[March, 2022]

41. Calculate the EMI under Flat Rate system for a loan of Rs. 5,00,000 with 10% annual interest rate for 5 years.

[March, 2022]

42. A man took a home loan of ₹ 40,00,000 from a bank at the interest of 6.75% per annum compounded monthly which is to be amortized by equal payments at the end of each month for 10 years.

Based on the above information, answer the following questions :

- (i) Find the monthly instalment. [Use $(1.005625)^{-120} = 0.510120$]
- (ii) Find the principal outstanding at the beginning of 61st month. [Use $(1.005625)^{60} = 1.400115$]
- (iii) (a) Find the interest amount paid in the 61st instalment.

OR

- (iii) (b) Find the principal amount paid in the 61st instalment.

[July, 2025]

43. Anil plans to send his daughter for higher studies abroad after 10 years. He expects the cost of the studies to be Rs. 2,00,000. How much must he set aside at the end of each quarter for 10 years to accumulate this amount, if money is worth 6% compounded quarterly? [Given: $(1.015)^{40} = 1.814$]

[July, 2022]

44. Each instalment can be considered as consisting of two parts:

- (i) Interest on the outstanding loan (ii) Repayment of part of the loan.

Methods of calculation of EMI or Instalment: -

EMI or Instalment can be calculated by two methods:

1. Flat Rate Method

2. Reducing-balance method or Amortization of Loan

Rajesh purchased a house from a company for ₹ 2500000 and made a down payment of ₹ 500000.

He repays the balance in 25 years by monthly instalments at the rate of 9% per annum

compounded monthly. [Given $(1.0075)^{-300} = 0.1062$]

Based on the above information, answer the following questions:

- (i) Find the number of payments and find the rate of interest per month.
- (ii) (a) What are the monthly payments of instalments using reducing balance method?

OR

- (ii) (b) What are the monthly payments of instalments using flat rate method?

- (iii) What is the total interest payment made in the process applied to calculate EMI in the above part (ii) ?

[SQP 24-25]

45. A machine costing ₹50,000 is to be replaced at the end of 10 years, when it will have a salvage value of ₹5000. In order to provide money at that time for a machine costing the same amount, a sinking fund is set up. If equal payments are placed in the fund at the end of each quarter and the fund earns 8% compounded quarterly, then what should each payment be? [Given $(1.02)^{40} = 2.208$]
- [SQP 21-22]
46. A couple wishes to purchase a house for ₹15,00,000 with a down payment of ₹4,00,000. If they can amortize the balance at an interest rate 9% per annum compounded monthly for 10 years, find the monthly instalment (EMI). Also find the total interest paid. [Given $(1.0075)^{-120} = 0.4079$]
- [SQP 21-22]
47. A ₹2000, 8% bond is redeemable at the end of 10 years at ₹105. Find the purchase price to yield 10% effective rate. [Given $(1.1)^{-10} = 0.3855$] [5M] [BOND QUESTION]
- [SQP 21-22]