Banking (Recurring Deposit Accounts)

Question 1.
Manish opens a Recurring Deposit Account with the Bank of Rajasthan and deposits ₹ 600 per month for 20 months. Calculate the maturity value of this account, if the bank pays interest at the rate of 10% per annum.

Solution:
Installment per month(P) = ₹ 600
Number of months(n) = 20
Rate of interest(r) = 10% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 600 \times \frac{20(20+1)}{2 \times 12} \times \frac{10}{100}$$
$$= 600 \times \frac{420}{24} \times \frac{10}{100} = Rs1,050$$

The amount that Manish will get at the time of maturity
= ₹ (600×20) + ₹ 1,050
= ₹ 12,000 + ₹ 1,050
= ₹ 13,050

Question 2.
Mrs. Mathew opened a Recurring Deposit Account in a certain bank and deposited ₹ 640 per month for 4 ½ years. Find the maturity value of this account, if the bank pays interest at the rate of 12% per year.

Solution:
Installment per month(P) = ₹ 640
Number of months(n) = 54
Rate of interest(r)= 12% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 640 \times \frac{54(54+1)}{2 \times 12} \times \frac{12}{100}$$
$$= 640 \times \frac{2970}{24} \times \frac{12}{100} = Rs9,504$$

The amount that Manish will get at the time of maturity
= ₹ (640×54) + ₹ 9,504
= ₹ 34,560 + ₹ 9,504
= ₹ 44,064

Question 3.
Each of A and B both opened recurring deposit accounts in a bank. If A deposited ₹ 1,200 per month for 3 years and B deposited ₹ 1,500 per month for 2 ½ years; find, on maturity, who will get more amount and by how much? The rate of interest paid by the bank is 10% per annum.

Solution:
For A
Installment per month(P) = ₹ 1,200
Number of months(n) = 36
Rate of interest(r) = 10% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 1,200 \times \frac{36(36+1)}{2 \times 12} \times \frac{10}{100}$$
$$= 1,200 \times \frac{1332}{24} \times \frac{10}{100} = Rs6,660$$

The amount that A will get at the time of maturity
= ₹ (1,200×36) + ₹ 6,660
= ₹ 43,200 + ₹ 6,660
= ₹ 49,860
For B

Instalment per month(P) = ₹ 1,500
Number of months(n) = 30
Rate of interest(r) = 10% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 1,500 \times \frac{30(30+1)}{2 \times 12} \times \frac{10}{100}$$
$$= 1,500 \times \frac{930}{24} \times \frac{10}{100} = Rs5,812.50$$

The amount that B will get at the time of maturity

= ₹ (1,500×30) + ₹ 5,812.50
= ₹ 45,000 + ₹ 5,812.50
= ₹ 50,812.50

Difference between both amounts = ₹ 50,812.50 – ₹ 49,860
= ₹ 952.50

Then B will get more money than A by ₹ 952.50.

Question 4.
Ashish deposits a certain sum of money every month is a Recurring Deposit Account for a period of 12 months. If the bank pays interest at the rate of 11% p.a. and Ashish gets ₹ 12,715 as the maturity value of this account, what sum of money did money did he pay every month?

Solution:
Let Installment per month(P) = ₹ y
Number of months(n) = 12
Rate of interest(r) = 11% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= y \times \frac{12(12+1)}{2 \times 12} \times \frac{11}{100}$$
$$= y \times \frac{156}{24} \times \frac{11}{100} = Rs\,0.715y$$

Maturity value = ₹ (y × 12) + ₹ 0.715y = ₹ 12.715y
Given maturity value = ₹ 12,715
Then ₹ 12.715y = ₹ 12,715

$$\Rightarrow \quad y = \frac{12,715}{12.715} = Rs\,1,000$$

Question 5.
A man has a Recurring Deposit Account in a bank for 3 ½ years. If the rate of interest is 12% per annum and the man gets ₹ 10,206 on maturity, find the value of monthly instalments.

Solution:
Let Installment per month(P) = ₹ y
Number of months(n) = 42

Rate of interest(r) = 12% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= y \times \frac{42(42+1)}{2 \times 12} \times \frac{12}{100}$$
$$= y \times \frac{1806}{24} \times \frac{12}{100} = Rs9.03y$$

Maturity value= ₹ (y × 42) + ₹ 9.03y= ₹ 51.03y
Given maturity value = ₹ 10,206
Then ₹ 51.03y = ₹ 10206

$$\Rightarrow \quad y = \frac{10206}{51.03} = \quad Rs200$$

Question 6.
(i) Puneet has a Recurring Deposit Account in the Bank of Baroda and deposits ₹ 140 per month for 4 years. If he gets ₹ 8,092 on maturity, find the rate of interest given by the bank.
(ii) David opened a Recurring Deposit Account in a bank and deposited ₹ 300 per month for two years. If he received ₹ 7,725 at the time of maturity, find the rate of interest per annum.

Solution:
(a)
Installment per month(P) = ₹ 140
Number of months(n) = 48
Let rate of interest(r) = r% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 140 \times \frac{48(48+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 140 \times \frac{2352}{24} \times \frac{r}{100} = Rs(137.20)r$$

Maturity value= ₹ (140 × 48) + ₹ (137.20)r
Given maturity value = ₹ 8,092
Then ₹ (140 × 48) + ₹ (137.20)r = ₹ 8,092
⇒ 137.20r = ₹ 8,092 – ₹ 6,720

$$\Rightarrow r = \frac{1,372}{137.20} = 10\%$$

(b)
Instalment per month(P) = ₹ 300
Number of months(n) = 24
Let rate of interest(r)= r% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 300 \times \frac{24(24+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 300 \times \frac{600}{24} \times \frac{r}{100} = Rs(75)r$$

Maturity value = ₹ (300 × 24) + ₹ (75)r
Given maturity value = ₹ 7,725

Then ₹ (300 × 24) + ₹ (75)r = ₹ 7,725
⇒ 75 r = ₹ 7,725 – ₹ 7,200

$$\Rightarrow r = \frac{525}{75} = 7\%$$

Question 7.
Amit deposited ₹ 150 per month in a bank for 8 months under the Recurring Deposit Scheme. What will be the maturity value of his deposits, if the rate of interest is 8% per annum and interest is calculated at the end of every month?

Solution:
Installment per month(P) = ₹ 150
Number of months(n) = 8
Rate of interest(r) = 8% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 150 \times \frac{8(8+1)}{2 \times 12} \times \frac{8}{100}$$
$$= 150 \times \frac{72}{24} \times \frac{8}{100} = Rs36$$

The amount that Manish will get at the time of maturity

= ₹ (150 × 8) + ₹ 36
= ₹ 1,200 + ₹ 36
= ₹ 1,236

Question 8.
Mrs. Geeta deposited ₹ 350 per month in a bank for 1 year and 3 months under the Recurring Deposit Scheme. If the maturity value of her deposits is ₹ 5,565; find the rate of interest per annum.

Solution:
Installment per month(P) = ₹ 350
Number of months(n) = 15
Let rate of interest(r)= r% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 350 \times \frac{15(15+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 350 \times \frac{240}{24} \times \frac{r}{100} = Rs(35)r$$

Maturity value= ₹ (350 × 15) + ₹ (35)r
Given maturity value = ₹ 5,565
Then ₹ (350 × 15) + ₹ (35)r = ₹ 5,565
⇒ 35r = ₹ 5,565 – ₹ 5,250

$$\Rightarrow r = \frac{315}{35} = 9\%$$

Question 9.
A recurring deposit account of ₹ 1,200 per month has a maturity value of ₹ 12,440. If the rate of interest is 8% and the interest is calculated at the end of every month; find the time (in months) of this Recurring Deposit Account.

Solution:
Installment per month(P) = ₹ 1,200
Number of months(n) = n
Let rate of interest(r) = 8% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 1,200 \times \frac{n(n+1)}{2 \times 12} \times \frac{8}{100}$$
$$= 1,200 \times \frac{n(n+1)}{24} \times \frac{8}{100} = \text{Rs } 4n(n+1)$$

Maturity value = ₹ (1,200 × n) + ₹ 4n(n+1) = ₹ ($1200n+4n^2+4n$)
Given maturity value= ₹ 12,440
Then $1200n+4n^2+4n = 12,440$

$$\Rightarrow 4n^2 + 1204n - 12440 = 0$$
$$\Rightarrow n^2 + 301n - 3110 = 0$$
$$\Rightarrow (n + 311)(n - 10) = 0$$
$$\Rightarrow n = -311 \text{ or } n = 10 \text{ months}$$

Then number of months = 10

Question 10.
Mr. Gulati has a Recurring Deposit Account of ₹ 300 per month. If the rate of interest is 12% and the maturity value of this account is ₹ 8,100; find the time (in years) of this Recurring Deposit Account.

Solution:
Installment per month(P) = ₹ 300
Number of months(n) = n
Let rate of interest(r)= 12% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 300 \times \frac{n(n+1)}{2 \times 12} \times \frac{12}{100}$$
$$= 300 \times \frac{n(n+1)}{24} \times \frac{12}{100} = \text{Rs } 1.5n(n+1)$$

Maturity value= ₹ (300 × n)+ ₹ 1.5n(n+1)
= ₹ ($300n+1.5n^2+1.5n$)
Given maturity value= ₹ 8,100
Then $300n+1.5n^2+1.5n = 8,100$

$\Rightarrow 1.5n^2 + 301.5n - 8100 = 0$

$\Rightarrow n^2 + 201n - 5400 = 0$

$\Rightarrow (n + 225)(n - 24) = 0$

$\Rightarrow n = -225$ or $n = 24$ months

Then time = 2 years.

Question 11.
Mr. Gupta opened a recurring deposit account in a bank. He deposited ₹ 2,500 per month for two years. At the time of maturity he got ₹ 67,500. Find:
(i) the total interest earned by Mr. Gupta
(ii) the rate of interest per annum.

Solution:
(i)
Maturity value = ₹ 67,500
Money deposited = ₹ 2,500 × 24= ₹ 60,000
Then total interest earned = ₹ 67,500 – ₹ 60,000 = ₹ 7,500 Ans.

(ii)
Installment per month(P) = ₹ 2,500
Number of months(n) = 24
Let rate of interest(r)= r% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$

$$= 2500 \times \frac{24(24+1)}{2 \times 12} \times \frac{r}{100}$$

$$= 2500 \times \frac{600}{24} \times \frac{r}{100} = Rs(625)r$$

Then $625r = 7500$

$$\Rightarrow r = \frac{7500}{625} = 12\%$$

Exercise 2B

Question 1.

Pramod deposits ₹ 600 per month in a Recurring Deposit Account for 4 years. If the rate of interest is 8% per year; calculate the maturity value of his account.

Solution:
Installment per month(P) = ₹ 600
Number of months(n) = 48
Rate of interest(r)= 8% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 600 \times \frac{48(48+1)}{2 \times 12} \times \frac{8}{100}$$
$$= 600 \times \frac{2352}{24} \times \frac{8}{100} = Rs4,704$$

The amount that Manish will get at the time of maturity
= ₹ (600 × 48) + ₹ 4,704
= ₹ 28,800 + ₹ 4,704
= ₹ 33,504

Question 2.
Ritu has a Recurring Deposit Account in a bank and deposits ₹ 80 per month for 18 months. Find the rate of interest paid by the bank if the maturity value of account is ₹ 1,554.

Solution:
Installment per month(P) = ₹ 80
Number of months(n) = 18
Let rate of interest(r) = r% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 80 \times \frac{18(18+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 80 \times \frac{342}{24} \times \frac{r}{100} = Rs(11.4r)$$

Maturity value = ₹ (80 × 18) + ₹ (11.4r)
Given maturity value = ₹ 1,554
Then ₹ (80 × 18) + ₹ (11.4r) = ₹ 1,554
⇒ 11.4r = ₹ 1,554 – ₹ 1,440

$$\Rightarrow r = \frac{114}{11.4} = 10\%$$

Question 3.
The maturity value of a R.D. Account is ₹ 16,176. If the monthly installment is ₹ 400 and the rate of interest is 8%; find the time (period) of this R.D Account.

Solution:
Installment per month(P) = ₹ 400
Number of months(n) = n
Let rate of interest(r)= 8% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$

$$= 400 \times \frac{n(n+1)}{2 \times 12} \times \frac{8}{100}$$

$$= 400 \times \frac{n(n+1)}{24} \times \frac{8}{100} = Rs\,\frac{4n(n+1)}{3}$$

$$\text{Maturity value} = Rs(400 \times n) + Rs\,\frac{4n(n+1)}{3}$$

Given maturity value= Rs16,176

$$\text{Then } Rs(400 \times n) + Rs\,\frac{4n(n+1)}{3} = Rs16,176$$

⇒ $1200n + 4n^2 + 4n$= ₹ 48,528
⇒ $4n^2 + 1204n$ = ₹ 48,528
⇒ $n^2 + 301n - 12132 = 0$
⇒ $(n+337)(n-36)=0$
⇒ n = -337 or n=36

Then number of months = 36 months = 3 years

Question 4.
Mr. Bajaj needs ₹ 30,000 after 2 years. What least money (in multiple of 5) must he deposit every month in a recurring deposit account to get required money after 2 years, the rate of interest being 8% p.a.?

Solution:
Let installment per month = ₹ P
Number of months(n) = 24
Rate of interest = 8% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= P \times \frac{24(24+1)}{2 \times 12} \times \frac{8}{100}$$
$$= P \times \frac{600}{24} \times \frac{8}{100} = Rs(2)P$$

Maturity value = ₹ (P × 24)+ ₹ 2P = ₹ 26P
Given maturity value = ₹ 30,000

$$\text{Then } 26P = Rs30,000$$
$$\Rightarrow \quad P = Rs\frac{30,000}{26} = Rs1153.84 = Rs1155(\text{multiple of } 5)$$

Question 5.
Rishabh has recurring deposit account in a post office for 3 years at 8% p.a. simple interest. If he gets ₹ 9,990 as interest at the time of maturity, find:
(i) The monthly installment.
(ii) The amount of maturity.

Solution:
Let Installment per month = ₹ P
Number of months(n) = 36
Rate of interest(r)= 8% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= P \times \frac{36(36+1)}{2 \times 12} \times \frac{8}{100}$$
$$= P \times \frac{1332}{24} \times \frac{8}{100} = Rs(4.44)P$$

Given interest = ₹ 9,990

$$\text{Then } 4.44P = Rs9,990$$
$$\Rightarrow \quad P = Rs\frac{9,990}{4.44} = Rs2,250$$

(ii) Maturity value = ₹ (2,250 × 36) + ₹ 9,990 = ₹ 90,990

Question 6.
Gopal has a cumulative deposit account and deposits ₹ 900 per month for a period of 4 years he gets ₹ 52,020 at the time of maturity, find the rate of interest.

Solution:
Installment per month(P) = ₹ 900
Number of months(n) = 48
Let rate of interest(r)= r% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 900 \times \frac{48(48+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 900 \times \frac{2352}{24} \times \frac{r}{100} = Rs(882)r$$

Maturity value= ₹ (900 × 48) + ₹ (882)r
Given maturity value = ₹ 52,020
Then ₹ (900 × 48) + ₹ (882)r = ₹ 52,020
⇒ 882r = ₹ 52,020 – ₹ 43,200

$$\Rightarrow r = \frac{8820}{882} = 10\%$$

Question 7.
Deepa has a 4-year recurring deposit account in a bank and deposits ₹ 1,800 per month. If she gets ₹ 1,08,450 at the time of maturity, find the rate of interest.

Solution:
Installment per month(P) = ₹ 1,800
Number of months(n) = 48
Let rate of interest(r)= r% p.a.

$$\therefore \quad S.I. = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 1,800 \times \frac{48(48+1)}{2 \times 12} \times \frac{r}{100}$$
$$= 1,800 \times \frac{2352}{24} \times \frac{r}{100} = Rs(1,764)\,r$$

Maturity value = ₹ (1,800 x 48) + ₹ (1,764)r

Given maturity value = ₹ 1,08,450
Then ₹ (1,800 x 48) + ₹ (1764)r = ₹ 1,08,450
⇒ 1764r = ₹ 1,08,450 – ₹ 86,400

$$\Rightarrow r = \frac{22,050}{1,764} = 12.5\%$$

Question 8.
Mr. Britto deposits a certain sum of money each month in a Recurring Deposit Account of a bank. If the rate of interest is of 8% per annum and Mr. Britto gets Rs. 8,088 from the bank after 3 years, find the value of his monthly instalment.

Solution:

Let the value of the monthly instalment be Rs. P.
Since rate of interest (r) = 8%,
Number of months, n = 3 x 12 = 36
Maturity value (M.V.) = Rs. 8088

$$\therefore M.V. = P \times n + P \times \frac{n(n+1)}{2} \times \frac{r}{12 \times 100}$$

$$\Rightarrow 8088 = P \times 36 + P \times \frac{36 \times 37}{2} \times \frac{8}{12 \times 100}$$

$$\Rightarrow 8088 = 36P + 4.44P$$

$$\Rightarrow 8088 = 40.44P$$

$$\Rightarrow P = \frac{8088}{40.44} = 20$$

Thus, the value of his onthly instalment is Rs. 200.

Question 9.
Shahrukh opened a Recurring Deposit Acoount in a bank and deposited Rs. 800 per month for $1\frac{1}{2}$ years. If he received Rs. 15,084 at the time of maturity, find the rate of interest per annum.

Solution:

Monthly deposit (P) = Rs. 800

$n = \frac{3}{2} \times 12$ months = 18 months

Maturity value (M.V.) = Rs. 15084

Now, $M.V. = P \times n + P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$

$\Rightarrow 15084 = 800 \times 18 + 800 \times \frac{18 \times 19}{24} \times \frac{r}{100}$

$\Rightarrow 15084 = 14400 + 114r$

$\Rightarrow 114r = 684$

$\Rightarrow r = \frac{684}{114} = 6\%$

Thus, the rate of interest per anum is 6%.

Question 10.

Katrina opened a recurring deposit account with a Nationalised Bank for a period of 2 years. If the bank pays interest at the rate of 6% per annum and the monthly installment is ₹ 1,000, find the :

(i) interest earned in 2 years

(ii) maturity value

Solution:

(i) Monthly instalment (P) = Rs. 1000

Number of instalments (n) = 2 years = 2 x 12 months = 24 months

Rate of interest (r) = 6%

Interest = Rs. 6370

Now, $\text{Interest} = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$

$= 1000 \times \frac{24 \times 25}{24} \times \frac{6}{100}$

= Rs. 1500

Thus, the interest earned in 2 years is Rs. 1500.

(ii) Total money deposited in the bank = 24 x Rs. 1000 = Rs. 24000

∴ Maturity value = Total money deposited + Interest

= Rs. (24000 + 1500)

= Rs. 25500

Question 11.
Mohan has a recurring deposit account in a bank for 2 years at 6% p.a. simple interest. If he gets Rs. 1200 as interest at the time of maturity, find
(i) the monthly installment
(ii) the amount of maturity

Solution:
Interest, I = Rs. 1,200
Time, n = 2 years = 2 × 12 = 24 months
Rate, r = 6%

(i) To find: Monthly instalment, P
Now,

$$I = P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$$
$$\Rightarrow 1,200 = P \times \frac{24 \times 25}{24} \times \frac{6}{100}$$
$$\Rightarrow 1,200 = P \times \frac{3}{2}$$
$$\Rightarrow P = \frac{1,200 \times 2}{3}$$
$$\Rightarrow P = \text{Rs. } 800$$

So, the monthly instalment is Rs. 800.

(ii) Total sum deposited = P × n = Rs. 800 × 24 = Rs. 19,200
∴ Amount of maturity = Total sum deposited + Interest on it
= Rs. (19,200 + 1,200)
= Rs. 20,400

Question 11.
Peter has a recurring deposit account in Punjab National Bank at Sadar Bazar, Delhi for 4 years at 10% p.a. He will get ₹ 6,370 as interest on maturity. Find :
(i) monthly installment,
(ii) the maturity value of the account.

Solution:

(i) Let the monthly instalment be Rs. P.

n = 4 years = 4 x 12 months = 48 months

Rate of interest, r = 10%

Interest = Rs. 6370

Now, Interest $= P \times \frac{n(n+1)}{2 \times 12} \times \frac{r}{100}$

$\Rightarrow 6370 = P \times \frac{48 \times 49}{24} \times \frac{10}{100}$

$\Rightarrow 6370 = P \times \frac{49}{5}$

$\Rightarrow P = \frac{6370 \times 5}{49} =$ Rs. 650

Thus, the monthly instalment is Rs. 650.

(ii) Total money deposited in the bank = 48 x Rs. 650 = Rs. 31200

$\therefore$ Maturity value = Total money deposited + Interest

= Rs. (31200 + 6370)

= Rs. 37570