Assignment - 2

**Question 1:** Common data to question (i) to (iv)

The initial cost of a piece of construction equipment is Rs.30,00,000 having a useful life of 10 years. The estimated salvage value of the equipment at the end of the useful life is Rs.450,000.

[8 marks]

**Question (i):** The book value of the construction equipment at the end of 5th year using Straight-line method is:

a) Rs. 17,25,000  
b) Rs. 11,81,712  
c) Rs. 11,45,454  
d) None of these

**Question (ii):** The book value of the construction equipment at the end of 5th year (BV₅) and depreciation (d₅) for 5th year using Double-declining balance method are:

a) BV₅= Rs. 11,81,712.19; d₅= Rs. 2,78,181.82  
b) BV₅= Rs. 11,81,712.19; d₅= Rs. 2,42,037.44  
c) BV₅= Rs. 11,45,454.54; d₅= Rs. 2,78,181.82  
d) BV₅= Rs. 17,25,000.00; d₅= Rs. 1,27,341.13

**Question (iii):** Determine the book value (BV₅) of the construction equipment at the end of 5th year and depreciation (d₅) for 5th year using Sum-of-the-years-digits method?

a) BV₅= Rs. 11,81,712.19 ; d₅= Rs. 2,78,181.82  
b) BV₅= Rs. 11,81,712.19; d₅= Rs. 2,42,037.44  
c) BV₅= Rs. 11,45,454.54 ; d₅= Rs. 2,78,181.82  
d) BV₅= Rs. 17,25,000.00 ; d₅= Rs. 1,27,341.13

**Question (iv):** Determine accumulated depreciation at the end of 5th year using Sinking fund method, if interest rate is 8.2 % per year?

a) Rs.10,27,341.13  
b) Rs. 13,81,712.12  
c) Rs. 13,45,487.18  
d) Rs. 12,56,800.00
Solution:

Given: Original cost of equipment \( V \) = Rs. 30,00,000
Salvage value of equipment \( V_s \) = Rs. 4,50,000
Useful life \( n \) = 10 years

Calculate:
Annual depreciation and book value of the construction equipment at the end of 5\(^{th}\) year i.e. \( d_5 \) and \( BV_5 \) respectively.

Ans:
(i) Using straight line method-
As in this method annual depreciation \( d_1 = d_2 = d_3 = \ldots = d \).
Therefore,
Annual depreciation \( d = \frac{(V-V_s)}{n} \)
\[ d = \frac{(3000000-450000)}{10} = \text{Rs.2,55,000} \]
Book Value \( (V_5) \) after 5 years \( = V - d \times a = 3000000 - 255000 \times 5 = \text{Rs.1,72,5000} \)

(ii) Using Double-declining balance method

Amount to be depreciated = \( (V-V_s) = 3000000-450000 = \text{Rs.2550000} \)
Using straight line depreciation method
Annual depreciation = 2550000/10 = Rs.255000 per year
Annual depreciation (in terms of fraction of original cost) = 255000/3000000 =0.085
Thus for double decline method annual depreciation will be =2*0.085 =0.17
Thus for 1st year depreciation amount will be = 3000000*0.17= Rs. 510000
Book value at the end of 1\(^{st}\) year \( (V_1) = (3000000-510000) = \text{Rs. 2490000} \)
For 2nd year depreciation amount will be= Recent Book value\(^{0.17} = \text{2490000}(1-0.17) = \text{Rs.423300} \)
Book value at the end of 2\(^{nd}\) year \( (V_2) = (2490000-423300) = \text{Rs. 2066700} \)
For 3rd year depreciation amount will be= Recent Book value\(^{0.17} = \text{2066700}(1-0.17) = \text{Rs.351339} \)
Book value at the end of 3\(^{rd}\) year \( (V_3) = (2066700-351339) = \text{Rs. 1715361} \)
For 4th year depreciation amount will be= Recent Book value\(^{0.17} = \text{1715361}(1-0.17) = \text{Rs.291611.37} \)
Book value at the end of 4\(^{th}\) year \( (V_4) = (1715361-291611.37) = \text{Rs. 1423749.63} \)
For 5th year depreciation amount will be= Recent Book value\(^{0.17} = \text{1423749.63}(1-0.17) = \text{Rs.242037.44} \)
Book value at the end of 5\(^{th}\) year \( (V_5) = (1423749.63-242037.44) = \text{Rs. 1181712.19} \)

Alternate Method
\[ d_5 = VB_4 \times f = V \times (1-f)^4 \times f = 3000000(1-0.17)^4 \times 0.17 = \text{Rs.2,42,037.44} \]
\( \text{VB}_5 = V \times (1-f)^5 = 3000000 \times (1-0.17)^5 = \text{Rs}.1181712.19 \)

(iii) Using Sum of years digits method

Depreciable cost = Rs.3000000-Rs.450000=Rs.2550000
Sum of the years' digits for n years = 1 + 2 + 3 + ...... + (n-1) + n
= (n+1) x (n / 2) = (10+1)\times10/2= 55
or Sum of the years' digits = 1+2+3+...+10 = 55
Depreciation for 1\(^{st}\) year = (2550000) x 10/55 = 10\times46363.63636=Rs.463636.36
Book value at the end of 1\(^{st}\) year= (3000000-463636.36) = Rs. 2536363.64
Depreciation for 2\(^{nd}\) year= (2550000) x 9/55 =9\times46363.63636=Rs. 417272.73
Book value at the end of 2\(^{nd}\) year= (2536363.64-417272.73) = Rs. 2119090.91
Depreciation for 3\(^{rd}\) year = (2550000) x 8/55 = 8\times46363.63636=Rs. 370909.09
Book value at the end of 1\(^{st}\) year= (2119090.91-370909.09) = Rs. 1748181.82
Depreciation for 4\(^{th}\) year= (2550000) x 7/55 = 7\times46363.63636=Rs. 324545.45
Book value at the end of 1\(^{st}\) year= (1748181.82-324545.45) = Rs. 1423636.37
Depreciation for 5\(^{th}\) year = (2550000) x 6/55 = 6\times46363.63636=\text{Rs. 278181.82}
Book value at the end of 5\(^{th}\) year= (1423636.37-278181.82) = \text{Rs. 1145454.54}

Alternate Method

d\(_5\) = 2*(n-a+1)(V-V_s)/[n*(n+1)]; where a= 5; d\(_5\) = \text{Rs.278181.82}
VB\(_5\) = 30,00,000-(10+9+8+7+6)*25,50,000/55 = \text{Rs.1145454.54}

(iv) Using Sinking fund method:

Interest rate (i) = 8.2 % per year =0.082
V-Vs= 2550000, is the depreciable cost which should be accumulated at the end of 10th year or it can be called the future value at the end of 10th year which needs to be generated through constant equal installments ( R). R is the annual equal amount of depreciation.

\[ R = \left( V - V_s \right) \times \left[ \frac{i}{(1+i)^n - 1} \right] \]

Annual depreciation=R = 2550000*0.0684 = Rs. 174420
Book value at the end of 1\(^{st}\) year = (3000000-174420) = Rs. 2825580
Interest earned at the end of 2\(^{nd}\) year = 174420*0.082= Rs.14302.44
Increased in fund value for 2\(^{nd}\) year= (174420+14302.44) = Rs. 188722.44
Accumulated depreciation at the end of 2\(^{nd}\) year = (174420+188722.44) = Rs. 363142.44
Book value at the end of 2\(^{nd}\) year = (2825580-188722.44) = Rs. 2636857.56
Interest earned at the end of 3\(^{rd}\) year=363142.44*.082 =Rs. 29777.68
Increased in fund value for 3\textsuperscript{rd} year = (174420+29777.68) = Rs. 204197.68 
Accumulated depreciation at the end of 3\textsuperscript{rd} year = (363142.44+204197.68) = Rs. 567340.12 
Book value at the end of 3\textsuperscript{rd} year = (2636857.56-204197.68) = Rs. 2432659.88 
Interest earned at the end of 4\textsuperscript{th} year = 567340.12*.082 = Rs. 46521.89 
Increased in fund value for 4\textsuperscript{th} year = (174420+46521.89) = Rs. 220941.89 
Accumulated depreciation at the end of 4\textsuperscript{th} year = (567340.12+220941.89) = Rs. 788282.01 
Book value at the end of 4\textsuperscript{th} year = (2432659.88-220941.89) = Rs. 2211717.99 
Interest earned at the end of 5\textsuperscript{th} year = 788282.01*.082 = Rs. 64639.12 
Increased in fund value for 5\textsuperscript{th} year = (174420+64639.12) = Rs. 239059.12 
Accumulated depreciation at the end of 5\textsuperscript{th} year = (788282.01+239059.12) = Rs. 1027341.13 
Book value at the end of 5\textsuperscript{th} year = (2211717.09-239059.12) = Rs. 1972657.96

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Dep. Computed (Rs.)</th>
<th>Interest earned (Rs.)</th>
<th>Increase in fund value (Rs.)</th>
<th>Accumulated Depreciation (Rs.)</th>
<th>Book Value (Rs.)</th>
</tr>
</thead>
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<td>188722.44</td>
<td>363142.44</td>
<td>2636857.56</td>
</tr>
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<td>29777.68</td>
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<td>788282.01</td>
<td>2211717.99</td>
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<tr>
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<td>174420</td>
<td>64639.12</td>
<td>239059.12</td>
<td>1027341.13</td>
<td>1972657.96</td>
</tr>
</tbody>
</table>

**Question 2:** The original cost of a heat exchanger is Rs.1, 00,000. It has a useful life of 10 years. The estimated salvage value of the heat exchanger at the end of useful life is zero. Calculate the book value at the end of 3\textsuperscript{rd} year, using repair provision method, if the repairs and maintenance charges together were estimated to be Rs. 18,000 during the lifetime of the equipment. And also determine the annual depreciation to be provided? 

[2 marks]

a) BV\textsubscript{3} = Rs. 81,000 ; d= Rs. 18,000  
b) BV\textsubscript{3} = Rs. 81,000; d= Rs. 12,000  
c) BV\textsubscript{5} = Rs. 64,600; d= Rs. 11,800  
d) BV\textsubscript{5} = Rs. 38,000; d= Rs. 27,300

**Ans.**

Given:

Original cost of heat exchanger (V) = Rs. 1,00,000
Salvage value of equipment ($V_s$) = 0
Useful life (n) = 10 years
Estimated total cost of repair = Rs.18000
Calculate:
Annual depreciation and book value of the heat exchanger at the end of 3rd year
Solution:

Annual amount to be provided for depreciation (d):
= [(original cost-salvage value) + Estimated total cost of repair]/expected useful life
= [(100000-0) +18000]/10 = Rs.11800
Book value at the end of 3rd year = $V-a*d = 100000-3*11800 = Rs. 64600

Question 3: There are two plans for a new godown construction for storage. We can either go in for a new concrete building (Plan-1) or have an extension to the existing building (Plan-2). The new concrete building is estimated to cost Rs. 60,000 with a permanent life. Its annual maintenance, insurance and tax cost is expected to be Rs. 500. The extended building will cost Rs. 20,000 and annual maintenance, insurance, and tax cost being Rs. 800. Both plans have life spans of 20 year. Assuming 10% as an attractive return, and using the annual cost method, choose the correct statement-

a) We should go for the concrete construction (Plan-1), which has a total annual cost of Rs.3149.19
b) We should go for the extended construction (Plan-2), which has total annual cost Rs.7547.58.
c) We should go for extended construction (Plan-2), which has total annual cost Rs.3149.19
d) Both are equally economical.

Solution:

<table>
<thead>
<tr>
<th></th>
<th>Plan-1</th>
<th>Plan-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital investment(Rs.)</td>
<td>60000</td>
<td>20000</td>
</tr>
<tr>
<td>maintenance, insurance, and tax cost per year(Rs.)</td>
<td>500</td>
<td>800</td>
</tr>
<tr>
<td>Useful life (years),n</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Rate of return (%), i</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Annual cost of the capital recovery is the annuity based on time value of money that one has to pay throughout the useful life, which will be equal to the capital investment at the start of the 1st year.
Annual cost of capital recovery = Capital investment* $i / [1-(1+i)^n]$
For Plan-1
Annual cost of Capital recovery = 60000*0.1/[1-(1+0.1)^20] = Rs.7047.58

For Plan-2
Annual cost of Capital recovery = 20000*0.1/[1-(1+0.1)^20] = Rs.2349.19

<table>
<thead>
<tr>
<th></th>
<th>Plan-1</th>
<th>Plan-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital investment</td>
<td>Rs.60,000</td>
<td>Rs.20,000</td>
</tr>
<tr>
<td>Estimated useful life</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Maintenance, insurance, and tax cost per year</td>
<td>Rs.500</td>
<td>Rs.800</td>
</tr>
<tr>
<td>Rate of return</td>
<td>10%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Solution given below

| Annual cost of capital recovery | Rs.7047.58 | Rs.2349.19 |
| Total annual cost(annual cost of capital recovery + annual operating cost) | **Rs.7547.58** | **Rs.3149.19** |

Decision: We should go in for Plan-2 in comparison to Plan-1 as its total annual cost is low.

Question 4:- A restaurant buys a wood-burning stove for Rs. 20,000. The stove has a lifetime of 4 years and a salvage value of Rs. 1500. What is the accumulated depreciation (D₃) and book value (BV₃) at the end of 3rd year by Sinking fund method, if annual interest rate is 9%? [4 marks]

a) D₃=Rs.6738.88; BV₃=Rs. 14806.30
b) D₃=Rs. 6378.88, BV₃=Rs. 14608.30
c) D₃=Rs. 14608.30, BV₃=Rs. 6378.88
d) D₃=Rs. 13261.12, BV₃=Rs. 6738.88

Solution:
Given: Original cost of wood burning stove (V) = Rs. 20000
Salvage value of equipment (Vₚ) = Rs. 1500
Useful life (n) = 4 years
Calculate:
Accumulated Depreciation for 3rd year and asset value of the wood burning stove at the end of 3rd year

Ans:
Interest rate \( (i) = 9 \% \) per year = 0.09

\( V-V_s=Rs. \ 18500 \), is the depreciable cost which should be accumulated at the end of 4\(^{th}\) year or it can be called the future value at the end of 4\(^{th}\) year which needs to be generated yearly investment of Rs. \( R \). \( R \) is the annual equal amount of depreciation.

\[
R = (V - V_s) \times \frac{i}{(1 + i)^n - 1}
\]

Annual depreciation \( = R = 18500 \times 0.2187 = \text{Rs. 4045.37} \)

Book value at the end of 1\(^{st}\) year \( = (20000 - 4045.37) = \text{Rs. 15954.63} \)

Interest earned at the end of 2\(^{nd}\) year \( = 4045.37 \times 0.09 = \text{Rs. 364.08} \)

Increased in fund value for 2\(^{nd}\) year \( = (4045.37 + 364.08) = \text{Rs. 4409.45} \)

Accumulated depreciation at the end of 2\(^{nd}\) year \( = (4045.37 + 4409.45) = \text{Rs. 8454.82} \)

Book value at the end of 2\(^{nd}\) year \( = (15954.63 - 4409.45) = \text{Rs. 11545.18} \)

Interest earned at the end of 3\(^{rd}\) year \( = 8454.82 \times 0.09 = \text{Rs. 760.93} \)

Increased in fund value for 3\(^{rd}\) year \( = 8454.82 + 4806.30 = \text{Rs. 13261.12} \)

Accumulated depreciation at the end of 3\(^{rd}\) year \( = (8454.82 + 4806.30) = \text{Rs. 13261.12} \)

Book value at the end of 3\(^{rd}\) year \( = (11545.18 - 4806.30) = \text{Rs. 6738.88} \)

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Dep. Computed (Rs.)</th>
<th>Interest earned (Rs.)</th>
<th>Increase in fund value (Rs.)</th>
<th>Accumulated Depreciation (Rs.)</th>
<th>Book Value (Rs.)</th>
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<td>1193.51</td>
<td>5238.88</td>
<td>18499.99</td>
<td>1500.00</td>
</tr>
</tbody>
</table>

**Question 5:** 12 years ago M/s Z. Limited purchased a piece of equipment for Rs. 40,000. At the time the equipment was put into use the service life estimated was 20 years and salvage value was zero. On this basis a straight line method was set up. The equipment can now (after 12 years) be sold for Rs. 10,000. The total replacement cost of the equipment is Rs. 55,000. Assuming depreciation fund is available for purchase, compute how much new capital must be made available for the purchase of the equipment?

[3 marks]

a) Rs. 45000
b) Rs. 34000
c) Rs. 26000
Solution:

Given: \( V = \text{Rs.} 40,000 \)
\( n = 20 \text{ years}; V_s = \text{zero (after 20 years)} \)

Present value of equipment = Rs. 10,000 (according to question after 12 years)
Total replacement cost of equipment= Rs. 55,000

Straight line method is used for depreciation calculation, therefore
Annual depreciation (\( d \)) = \((\text{Original value of equipment } (V) - \text{Salvage value of equipment } (V_s))/\text{service life} \ (n)\)
\( d = (40000 - 0)/20 = \text{Rs.} 2000 \)

Total depreciation accumulated at the end of 12\(^{th}\) year = 2000*12 = Rs. 24,000
Rs. 24,000 is available as a fund for purchase (according to question)

So total available fund after selling the equipment = (10,000+24,000) = Rs. 34,000

Therefore,

New capital needed for the purchase of the new equipment is = \((\text{total cost of new equipment} - \text{total available fund after selling the equipment})\)
= (55,000-34,000) = \text{Rs.} 21,000

Question 6: Two pumps under consideration for installation at a plant have the following capital investments, salvage values and annual interest.

<table>
<thead>
<tr>
<th></th>
<th>Capital investment (Rs.)</th>
<th>Salvage value (Rs.)</th>
<th>Interest rate per annum (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump A</td>
<td>40,000</td>
<td>3900</td>
<td>10</td>
</tr>
<tr>
<td>Pump B</td>
<td>50,000</td>
<td>20,000</td>
<td>10</td>
</tr>
</tbody>
</table>

If annual cost of capital recovery is same for both the pumps. Then determine what should be the common life of the pumps. Maintenance and operational costs are negligible.

[4 marks]

a) 8 years
b) 5 years
c) 9 years
d) 6 years

Ans.

Given:

<table>
<thead>
<tr>
<th></th>
<th>Capital investment (Rs.),P</th>
<th>Salvage value (Rs.),SV</th>
<th>Interest rate per annum (%),i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump A</td>
<td>40,000</td>
<td>3900</td>
<td>10</td>
</tr>
</tbody>
</table>
Calculate: Common life of pump, if annual cost of capital recovery is same for both the pumps.

Solution:

**Method to directly compute annual cost of capital recovery when salvage value is given:**

Annual cost of capital recovery = \( \frac{(P-SV) \cdot i}{[1-(1+i)^n]} + SV \cdot i \)

Where \( P \)= present worth of capital investment

\( SV \)- Salvage value at the end of service life

Using the above formula

**For Pump A,**

Annual cost of capital recovery = \( \frac{(P-SV) \cdot i}{[1-(1+i)^n]} + SV \cdot i \)

\( = \frac{(40000 - 3900) \cdot 0.1}{[1-(1+0.1)^n]} + 3900 \cdot 0.1 \)

\( = 36100 \cdot \frac{0.1}{[1- 1.1^n]} + 390 \) ……. (i)

**Similarly for Pump B,**

Annual cost of capital recovery = \( \frac{(P-SV) \cdot i}{[1-(1+i)^n]} + SV \cdot i \)

\( = \frac{(50000 - 20000) \cdot 0.1}{[1-(1+0.1)^n]} + 20000 \cdot 0.1 \)

\( = 30000 \cdot \frac{0.1}{[1- 1.1^n]} + 2000 \) ……. (ii)

According to question, equate equation (i) and (ii)-

\( 36100 \cdot \frac{0.1}{[1- 1.1^n]} + 390 = 30000 \cdot \frac{0.1}{[1- 1.1^n]} + 2000 \)

\( 36100 \cdot \frac{0.1}{[1- 1.1^n]} = 30000 \cdot \frac{0.1}{[1- 1.1^n]} + 1610 \)

\( 6100 \cdot \frac{0.1}{[1- 1.1^n]} = 1610 \)

\( 6100 \cdot 0.1 / 1610 = [1- 1.1^n] \)

\( 1.1^n = 0.6211 \)

Taking logarithm both side-
(-n)\*\log (1.1) = \log (0.6211)

\[ n = 4.996 \text{ year} \approx 5 \text{ years} \]

**Question 7:** A choice has to be made by Mr. Abhishek between a new bike and a second-hand bike. The relevant data are:

<table>
<thead>
<tr>
<th></th>
<th>New bike</th>
<th>Second-hand bike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial investment(Rs.)</td>
<td>15,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Salvage value after 10 years of use(Rs.)</td>
<td>5,000</td>
<td>zero</td>
</tr>
<tr>
<td>Annual fuel cost for average 10,000 miles run(Rs.)</td>
<td>1,000</td>
<td>1,500</td>
</tr>
<tr>
<td>Annual repair cost(Rs.)</td>
<td>1,000</td>
<td>3,000</td>
</tr>
</tbody>
</table>

If Abhishek invest Rs. 15,000 or Rs. 5000 elsewhere, he except a return of 10%. Using the annual cost method, find out whether Abhishek should go for new bike or the second-hand bike?

[5 marks]

a) The New bike with total annual cost of Rs. 5313.72.
b) The Second-hand bike with total annual cost Rs. 5313.72.
c) Data insufficient to make a selection.
d) None of these

**Solution:**

Given:

<table>
<thead>
<tr>
<th></th>
<th>New bike</th>
<th>Second-hand bike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital investment (Rs.)</td>
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<td>5,000</td>
</tr>
<tr>
<td>Estimated useful life, year</td>
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<td>10</td>
</tr>
<tr>
<td>Salvage value (Rs.)</td>
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<td>zero</td>
</tr>
<tr>
<td>Annual fuel cost for average 10,000 miles run(Rs.)</td>
<td>1,000</td>
<td>1,500</td>
</tr>
<tr>
<td>Annual repair cost(Rs.)</td>
<td>1,000</td>
<td>3,000</td>
</tr>
</tbody>
</table>

Solution:

In this problem the salvage value (which is a receipt) is at a different time line than the capital investment. Hence, the Present value of the salvage value is to be calculated and then
it should be deducted from the capital investment for calculating annual cost of capital recovery.

Investment at the start of 1st year (for New bike) = Rs.15,000
Salvage value = Rs.5000 (at the end of 10th year)
To bring it to the time line of the investment, the Present worth of Rs.5000 is computed
Present worth of Rs.5000= 5000/ (1+0.1)\(^{10}\) = Rs.1927.72
Hence the capital expenditure at the start of 1st year = (Rs.15000-Rs.1927.72) = Rs.13072.28
Annual cost of capital recovery = Capital investment\(\times i/[1-(1+i)^{-n}]\)
For “new bike”
Annual cost of Capital recovery =13072.28\(\times 0.1/[1-(1+0.1)^{-10}]\) = Rs.2127.45
For “second hand bike”
Investment at the start of 1st year = Rs.5,000
Salvage value = zero (at the end of 10th year)
Hence the capital expenditure at the start of 1st year = Rs.5000
Annual cost of Capital recovery =5000\(\times 0.1/[1-(1+0.1)^{-10}]\) = Rs.813.72

<table>
<thead>
<tr>
<th></th>
<th>New bike</th>
<th>Second hand bike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital investment</td>
<td>Rs.15,000</td>
<td>Rs.5,000</td>
</tr>
<tr>
<td>Estimated useful life</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Salvage Value, Rs.</td>
<td>Rs.5000</td>
<td>zero</td>
</tr>
<tr>
<td>Annual fuel cost for average 10,000</td>
<td>1,000</td>
<td>1,500</td>
</tr>
<tr>
<td>miles run(Rs.)</td>
<td>1,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Annual repair cost(Rs.)</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Rate of return</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Solution given below

<table>
<thead>
<tr>
<th></th>
<th>New bike</th>
<th>Second hand bike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual cost of capital recovery</td>
<td>Rs. 2127.45</td>
<td>Rs.813.72</td>
</tr>
<tr>
<td>Total annual cost(annual cost of capital recovery + annual operating cost+ annual repair cost)</td>
<td>Rs.4127.45</td>
<td>Rs.5313.72</td>
</tr>
</tbody>
</table>

Decision: He should purchase “new bike” in comparison to “second hand-bike” as its total annual cost is low.

Question 8:- A firm purchased a heat exchanger for Rs. ‘V’. The salvage value of the heat exchanger after 9 years of service life is expected to be Rs. ‘V\(S\)’. In which year, annual depreciation amount by sum-of-years-digits method will be equal to the annual depreciation by straight line method for the above available information?
Solution:

Let “a” be the year when depreciation computed by straight line method and sum-of-years-digits method will be equal.

Annual depreciation cost, by Sum-of-the-Years Digits Method is \( (d_{as}) \):

\[
d_{as} = \frac{2(n-a+1)}{n(n+1)}(V - V_s)
\]

Taking \( n=9 \)

\[
d_{as} = \frac{2(9-a+1)}{9(9+1)}(V - V_s)
\]

\[\Rightarrow d_{as} = \frac{2(10-a)}{9(10)}(V - V_s) \quad (1)\]

Annual depreciation cost, by straight line method is: \( d_{st} = \frac{(V-V_s)}{n} \)

\[\Rightarrow d_{st} = \frac{(V-V_s)}{9} \quad (2)\]

Equate equation (1) and (2)-

\[
\frac{2 * (10 - a) * (V - V_s)}{9 * (10)} = \frac{(V - V_s)}{9}
\]

\[\Rightarrow a = 5\]

After solving the above equation value of ‘a’= 5 years, i.e. in 5th years depreciation calculated by both method will be equal.

Question 9:- A catering company purchased automated packaging equipment for Rs. 30,000. The salvage value of the equipment is anticipated to be Rs. 3,000 at the end of its five year life. Using the following methods determine-

(i) The depreciation for 2nd year and book value at the end of 2nd year using **Straight line method (SLM)**
(ii) The depreciation for 2nd year and book value at the end of 2nd year from **Sum of the-years-digits method** and
(iii) If annul repairs and maintenance cost is Rs. 2000, and annual rate of return to be expect is 10%. Then determine the Annual cost of the automated packaging equipment?
If sum of all values (i.e. depreciation as well as book values) calculated above in (i),(ii) and (iii) is ‘S’. Then the value of S will be-

[5 marks]

a) Rs. 55023
b) Rs. 65245
c) Rs. 53023
d) Rs. 57045

Solution:

Given:
Original cost of automated packaging equipment = Rs.30,000
Salvage value of equipment (V_s) = Rs. 3000
Useful life (n) = 5 years

(i) Using Straight line method
As in this method annual depreciation \(d_1=d_2=d_3=\ldots=d\).
Therefore,
Annual depreciation (d) =d_2=(\text{Original value of equipment (V)}-\text{Salvage value of equipment (V_s)})/\text{service life (n)}
\(d=d_2= (30000-3000)/5 = \text{Rs.5400}\)
Book Value (V_2) after 2 years =V-d*a = 30000-5400*2 = \text{Rs.19200}

(ii) Using Sum of the years digits method
Depreciable cost = Rs.30000-Rs.3000=Rs.27000
Sum of the years' digits for n years = 1 + 2 + 3 + ...... + (n-1) + n = (n+1) x (n / 2) = (5+1)*5/2= 15
or Sum of the years' digits = 1+2+3+4+5 = 15
Depreciation for 1st year = (27000) x 5/15 = 5*1800=Rs.9000
Book value at the end of 1st year= (30000-9000) = Rs. 21000
Depreciation for 2nd year= (27000) x4/15 =4*1800=\text{Rs.7200}
Book value at the end of 2nd year= (21000-7200) = \text{Rs. 13800}

(iii) Given: Initial investment = Rs.30,000
Salvage value = Rs.3000 (at the end of 5th year)
Annual repairs and maintenance cost = Rs. 2000
Ans:
To bring it to the same time line of the investment, the Present worth of Rs.3000 is computed.
Present worth of Rs.3000= 3000/(1+0.1)^5 = Rs.1862.7
Hence the capital expenditure at the start of 1st year = (Rs.30000-Rs.1862.76) = Rs.28137.24
Annual cost of capital recovery = Capital investment\(\times i/[1-(1+i)^{-n}]\)
Annual cost of Capital recovery =28137.24*0.1/[1-(1+0.1)^{-5}] = Rs.7422.53
Hence total annual cost of equipment is = (annual capital recovery+ annual repairs cost)=Rs. (7422.53+2000) = Rs. 9422.53

Thus, the value of ‘S’ = (5400+19200+7200+13800+9422.53) = Rs. 55022.53

Question 10:-M/s ABC Ltd. purchased a new brick making machine for Rs. 8,40,000. The salvage value of machine is anticipated to be zero at the end of it’s five-year life. Compute the book value of the machine at the end of 4th year, using the Modified accelerated cost recovery system method. Assuming the half-year convention is relevant. [4 marks]

a) Rs. 2,41,920
b) Rs. 1,72,800
c) Rs. 1,45,152
d) None of these

Solution:

By modified accelerated cost recovery system (MACRS) method:

<table>
<thead>
<tr>
<th>Year</th>
<th>Depreciation rate (%)</th>
<th>Calculation using formula</th>
<th>Depreciation (Rs.)</th>
<th>Book value(Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DDB</td>
<td>SLM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>20</td>
<td>20</td>
<td>840000\times(1/5)\times2(200%)\times0.5 (Half-year convention)</td>
<td>1,68,000</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
<td>17.7</td>
<td>(6,72,000)\times(1/5)\times(2)</td>
<td>2,68,800</td>
</tr>
<tr>
<td>3</td>
<td>19.20</td>
<td>13.7</td>
<td>(4,03,200) \times (1/5) \times 2</td>
<td>1,61,280</td>
</tr>
<tr>
<td>4</td>
<td>11.52</td>
<td>11.52</td>
<td>(2,41,920)\times(1/5)\times(2)</td>
<td>96,768</td>
</tr>
<tr>
<td>5</td>
<td>6.912</td>
<td>11.52[^2]</td>
<td>(1,45,152)\times(1/5)</td>
<td>96,768</td>
</tr>
<tr>
<td>6</td>
<td>5.76[^3]</td>
<td></td>
<td>96,768\times0.5</td>
<td>48,384</td>
</tr>
</tbody>
</table>

\[^1\]The double-declining-balance (DDB) method allows a depreciation of 2(1/5) = 0.4, but due to the half-year convention it reduces to 0.4/2=0.2 or 20%

\[^2\]During computation of depreciation value using MACRS, double declining balance method (DDBM) changes to straight-line method (SLM) when the later method provides greater depreciation than DDBM. Deductions under 200% declining balance MACRS for 5th year
would be Rs.58060.80 whereas depreciation using SLM is Rs.96,768. Thus for 5th year onward depreciation is charged by SLM.

[3] Due to half-year convention, depreciation charged for 6th year is half of the depreciation charged by SLM in 5th year.

Analysis:
The book value for machine at the end of 4th year is equal to Rs. 1, 45, 152.