# CA - Intermediate Test

## CAPITAL BUDGETING 1 & 2, LEASING

**Maximum Time: 200 Minutes** **Total Marks: 100**

**Solution.1: Type A Waste**

| | |
|---|---|
| Selling Price per tonne after further processing | 12.50 |
| Less: Loss of Selling Price before further processing (per tonne) | (2.00) |
| Less: Extra direct cost per tonne | (2.50) |
| Additional Contribution per tonne from further processing | 8.00 |
| Sale Quantity | 2,000 tonnes |
| Annual Additional Contribution Earned | ₹16,000 |
| Less: Extra Fixed Cost | (₹10,000) |
| Less: Opportunity Cost of Space (compensation to employee) | (₹500) |
| Net Annual Cash Inflows | ₹5,500 |
| P.V.F (8%, 4) | 3.31 |
| P.V. of Cash Inflows | ₹18,205 |
| P.V of Cash Outflows (Cost of Installing Plant) | (₹20,000) |
| **NPV** | **(₹1,795)** |

**Advise:** Reject the Proposal.

**Type B Waste**

| | |
|---|---|
| Cost of New Plant for Further Processing of type B waste | ₹1,20,000 |
| Less: Scrap of Containers (Scrap Value) | (₹18,000) |
| **P.V of Cash Outflow** | **₹1,02,000** |
| Selling Price per tonne | ₹11.00 |
| Add: Saving in disposal cost | ₹14.00 |
| Less: Extra Direct Cost per tonne | (₹13.50) |
| Contribution per tonne from further processing | ₹11.50 |
| Annual Quantity | 4,000 tonnes |
| Contribution | ₹46,000 |
| Less: Extra Fixed Cost | (₹20,000) |
| Add: Saving in Employees Salary | ₹9,000 |
| Annual Net Cash Inflows | ₹35,000 |
| P.V.F. (6.15%) | 3.78 |
| P.V of Cash Inflows | ₹1,32,300 |
| Less: P.V of Cash Outflows | (₹1,02,000) |
| **NPV** | **₹30,300** |

**Solution.2:** **Computation of Equivalent Annual Cost** **(Proposal 1)**

| Particulars | Year | PV factor (at 10%) | Cost (₹) | PV (₹) |
|---|---|---|---|---|
| Purchase cost | 0 | 1.000 | 1,50,000 | 1,50,000 |
| Operating costs | 1 | 0.909 | 20,000 | 18,180 |
| | 2 | 0.826 | 20,000 | 16,520 |
| | 3 | 0.751 | 20,000 | 15,020 |
| | 4 | 0.683 | 25,000 | 17,075 |
| | 5 | 0.621 | 25,000 | 15,525 |
| | 6 | 0.564 | 25,000 | 14,100 |
| Salvage value | 6 | 0.564 | (10,000) | (5,640) |
| **Total PV of Cash Outflows** | | | | **2,40,780** |

Equivalent Annual PVCO

$$= \frac{\text{Total present value of Cash Outflows}}{\text{PV of annuity corresponding to the life of the project at the given cost of capital}}$$

= ₹2,40,780/4.355 = ₹55,288.17

**(Proposal 2)**

| Particulars | Year | PV factor (at 10%) | Cost(₹) | PV(₹) |
|---|---|---|---|---|
| Purchase cost | 0 | 1.000 | 2,00,000 | 2,00,000 |
| Operating costs | 1 | 0.909 | 18,000 | 16,362 |
| | 2 | 0.826 | 18,000 | 14,868 |
| | 3 | 0.751 | 18,000 | 13,518 |
| | 4 | 0.683 | 22,000 | 15,026 |
| | 5 | 0.621 | 22,000 | 13,662 |
| | 6 | 0.564 | 22,000 | 12,408 |
| | 7 | 0.513 | 26,000 | 13,338 |
| | 8 | 0.467 | 26,000 | 12,142 |
| | 9 | 0.424 | 26,000 | 11,024 |
| | 10 | 0.386 | 26,000 | 10,036 |
| Salvage value | 10 | 0.386 | (15,000) | (5,790) |
| **Total PV** | | | | **3,26,594** |

Equivalent Annual PVCO = ₹3,26,594/6.145 = ₹53,148

Advise: Select proposal 2.

**Solution.3:** **Computation of P.V.C.I**

| Time | PV of ₹ 1 @ 12% | Project A | | | | Project B | | | | Project C | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cash Inflow | Cum. Cash flows | P.V of Inflows | Cum. P.V.C.I | Cash Inflows | Cum. Cash flows | P.V of Inflows | Cum. P.V.C.I | Cash Inflows | P.V of Inflows |
| 1 | 0.893 | 11,000 | 11,000 | 9,823 | 9,823 | 3,500 | 3,500 | 3,126 | 3,126 | 42,000 | 37,506 |
| 2 | 0.797 | 7,000 | 18,000 | 5,579 | 15,402 | 8,000 | 11,500 | 6,376 | 9,502 | (4,000) | (3,188) |
| 3 | 0.712 | 4,800 | 22,800 | 3,418 | 18,820 | 13,000 | 24,500 | 9,256 | 18,758 | -- | -- |
| | **P.V.C.I** | | | **18,820** | | | | **18,758** | | | **34,318** |

(a) Payback Period = 1 year + $\frac{4,000}{7,000}$ x 1 year = 1.57 years (Project A)

Payback Period = 2 years + $\frac{3,500}{13,000}$ x 1 year = 2.27 years (Project B)

Discounted Payback Period = 1 year + $\frac{5,177}{5,579}$ x 1 year = 1.93 years (Project A)

Discounted Payback Period = 2 years + $\frac{5,498}{9,256}$ = 2.59 years (Project B)

(b) **Calculation of NPV (₹)**

| Particulars | A | B | C |
|---|---|---|---|
| P.V.C.I | 18,820 | 18,758 | 34,318 |
| Less: P.V.C.O | (15,000) | (15,000) | (15,000) |
| **NPV** | **3,820** | **3,758** | **19,318** |

(c) **Determination of IRR (Project A)**

| Year | CFAT | PV factor (0.25) | PV factor (0.30) | Total PV (₹) (0.25) | Total PV (₹) (0.30) |
|---|---|---|---|---|---|
| 1 | 11,000 | 0.800 | 0.769 | 8,800 | 8,459 |
| 2 | 7,000 | 0.640 | 0.592 | 4,480 | 4,144 |
| 3 | 4,800 | 0.512 | 0.455 | 2,458 | 2,184 |
| **Total PV** | | | | **15,738** | **14,787** |
| Less: Initial outlay | | | | (15,000) | (15,000) |
| **NPV** | | | | **738** | **(213)** |

The IRR is between 25 and 30%. By interpolation, IRR = 28.89%.

**Determination of IRR (Project B)**

| Year | CFAT | PV factor (0.20) | PV factor (0.30) | Total PV (₹) (0.20) | Total PV (₹) (0.30) |
|---|---|---|---|---|---|
| 1 | 3,500 | 0.833 | 0.769 | 2,916 | 2,692 |

| | | | | | |
|---|---|---|---|---|---|
| 2 | 8,000 | 0.694 | 0.592 | 5,552 | 4,736 |
| 3 | 13,000 | 0.579 | 0.455 | 7,527 | 5,915 |
| Total PV | | | | 15,995 | 13,343 |
| Less: Initial outlay | | | | (15,000) | (15,000) |
| NPV | | | | 995 | (1,657) |

The IRR is between 20 and 30 per cent. By interpolation, IRR = 23.75 per cent.

**Determination of IRR (Project C)**

| | | PV factor | | Total PV (₹) | |
|---|---|---|---|---|---|
| Year | CFAT | (1.50) | (2.00) | (1.500) | (2.00) |
| 1 | 42,000 | 0.400 | 0.333 | 16,800 | 13,986 |
| 2 | (4,000) | 0.160 | 0.111 | (640) | (444) |
| Total PV | | | | 16,160 | 13,542 |
| Less: Initial outlay | | | | (15,000) | (15,000) |
| NPV | | | | 1,160 | (1,458) |

The IRR is between 150 and 200 per cent. By interpolation, IRR = 172 per cent.

(d) Computation of MIRR

Terminal Value (A) = $11,000\ (1.12)^2 + 7,000 \times (1.12)^1 + 4,800$ = ₹ 26,438

PVF of Re1 at the end of 3 years = $\frac{15,000}{26,438}$ = 0.567

Looking in table A & interpolating we get MIRR = 20.82%.

Terminal Value (B) = $3,500\ (1.12)^2 + 8,000 \times (1.12)^1 + 13,000$ = ₹ 26,350

PVF of Re1 at the end of 3 years = $\frac{15,000}{26,350}$ = 0.569

Looking in table A & interpolating we get MIRR = 20.68%.

Terminal Value (C) = $42,000\ (1.12)^2 + (-4,000) \times (1.12)^1$ = ₹ 48,205

PVF of Re1 at the end of 3 years = $\frac{15,000}{48,205}$ = 0.311

Looking in table A & interpolating we get MIRR = 47.56%.

**Solution.4:** At IRR project P.V.C.O = P.V.C.I

Project P.V.C.I. at IRR = P.V.C.O. = (1,00,000 x 4.1925) = ₹4,19,250

Therefore, Initail Investment = ₹4,19,250

P.I at cost of capital = $\frac{\text{P.V.C.I at } COC}{\text{P.V.C.O}}$

$1.1089 = \frac{\text{P.V.C.I at } COC}{4,19,250}$

P.V.C.I at *COC* = ₹4,64,906

NPV = 4,64,906 – 4,19,250 = ₹45,656

P.V.C.I at *COC* = Annual C.I. x Cum P.V.A.F of *COC*

4,64,906 = 1,00,000 x Cum P.V.A.F at *COC*

Cum P.V.A.F. at *COC* = $\frac{4,64,906}{1,00,000}$ = 4.64906

Reference to Table B in 10th year gives Cost of Capital = 17%.

**Solution.5: Statement Showing Evaluation of Replacement Proposals**

| **Particulars** | **Time** | **P.V.F.** | **Amount (₹)** | **P.V.(₹)** |
|---|---|---|---|---|
| **Cash Outflows:** | | | | |
| Cost of New Machine | 0 | 1 | 3,00,000 | 3,00,000 |
| Less: Scrap Value | 0 | 1 | (10,000) | (10,000) |
| Less: Tax Savings on Capital Loss (WN1) | 1 | 0.870 | (20,000) | (17,400) |
| **P.V.C.O. (A)** | | | | **2,72,600** |
| **Cash Inflows:** | | | | |
| Incremental CFBT (given) | 1-5 | 3.352 | 1,13,000 | 3,78,776 |
| Less: Incremental Tax (see WN 2) | 2-6 | 2.915 | (26,000) | (75,790) |

| | | | | |
|---|---|---|---|---|
| **P.V.C.I. (B)** | | | | **3,02,986** |
| **NPV (B) – (A)** | | | | **30,386** |

**Advise:** Accept the Proposal.

| | | | |
|---|---|---|---|
| WN 1: | S.P. of old machine today | | 10,000 |
| | Less: WDV | | (60,000) |
| | Capital Loss | | (50,000) |
| | **Tax Savings (40%)** | | **20,000** |
| WN 2: | Incremental contribution (CFBT) (given) [1-5] | (1) | 1,13,000 |
| | (-)Incremental Depreciation | | |
| | 3,00,000/5 - 60,000/5 | | (48,000) |
| | Incremental PBT | | 65,000 |
| | **Tax (40%)** | **(2)** | **26,000** |

**Solution.6: Consideration of feasible combinations & their N.P.V.**

| Feasible Combination | Outlay (₹ in lakhs) | N.P.V. |
|---|---|---|
| A & C | 30.0 | 12.5 |
| A & D | 25.5 | 11.1 |
| A & E | 24.0 | 10.5 |
| B, D & E | 28.5 | 12.6 |
| C, D & E | 25.5 | 11.6 |

Desirable feasible combination of projects consists of B, D & E giving highest NPV.

**Solution: .7** (a) **Statement showing Expected Value of Sales volume p.a.**

| Sales Volume (Units) | Probability | Expected Sales Value (Units) |
|---|---|---|
| 2,000 | 0.10 | 200 |
| 6,000 | 0.25 | 1,500 |
| 8,000 | 0.40 | 3,200 |
| 10,000 | 0.15 | 1,500 |
| 14,000 | 0.10 | 1,400 |
| | | **7,800** |

Estimated value of contribution will be ₹31,200 [i.e. 7,800 x (10 – 6)] All additional fixed costs are cash items (As given in the question). Estimated value of additional cash profits each year will therefore be ₹11,200.

| | Year | Cash Flows ₹ | Discount Factor 10% | PV of Cash Flows ₹ |
|---|---|---|---|---|
| | 0 | (40,000) | 1.000 | (40,000) |
| | 1.6 | 11,200 | 4.355 | 48,776 |
| | 6 | 3,000 | 0.5645 | 1,694 |
| **Expected Value of NPV** | | | | **10,470** |

(b) In order to break-even, the NPV must be Zero. Assuming that the cost of the equipment and its residual value are known with certainty, we can calculate the minimum required PV of annual cash profits as given below

| | **Present Value (₹)** |
|---|---|
| PV of capital out lay | 40,000 |
| Less: PV of residual value | (1,694) |
| **PV of annual cash profit required for NPV of 0** | **38,306** |
| Discount Factor of ₹1 p.a. for 6 years @ 10% | 4,355 |
| Annual cash profit required (38,306/4.355) | 8,796 |
| Add: Annual (cash) Fixed costs | 20,000 |
| | **28,796** |
| Annual contribution required for NPV = 0 | 28,796 |
| Contribution per unit | ₹4 |

Hence, Annual Sales required to Break-Even = 28,796/4 = 7,199 units or 7,200 units (rounded off).

**Solution.8:**

| **Year** | **1** | **2** | **3** |
|---|---|---|---|
| Sales Volume | 20,000 Units | 30,000 Units | 30,000 Units |
| | ₹ | ₹ | ₹ |

| | | | |
|---|---|---|---|
| Cash Profit (₹20 per Unit) | 4,00,000 | 6,00,000 | 6,00,000 |
| P.V Factor | 0.909 | 0.826 | 0.751 |
| **P.V of Cash Inflows** | **3,63,600** | **4,95,600** | **4,50,600** |
| | (₹) | | |
| Total P.V Cash Inflows | 13,09,800 | | |
| Less: Initial Cost of the Project | (10,00,000) | | |
| **N.P.V** | **3,09,800** | | |

(a) Let Minimum Selling Price Per unit be x

{(20,000 units × x) × 0.909} + {(30,000 units × x) × 0.826} + {(30,000 units × x) × 0.751} - [(8,00,000 × 0.909) + (12,00,000 × 0.826) + (12,00,000 × 0.751)] = 10,00,000

(18,180x + 24,780x + 22,530x) = 7,27,200 + 9,91,200 + 9,01,200 + 10,00,000

65,490x = 36,19,600

x = ₹55.27

Sensitivity on SP per unit = $\frac{₹60 - ₹55.27}{₹60} \times 100 = 7.88\%$

(b) Let Maximum Unit Cost be y

{(12,00,000 × 0.909) + (18,00,000 × 0.826) + (18,00,000 × 0.751)} – 65490y = 10,00,000

10,90,800 + 14,86,800 + 13,51,800 – 65,490y = 10,00,000

$y = \frac{29,29,400}{65,490} = ₹44.73$

Sensitivity of Unit Cost = $\frac{₹44.73 - ₹40}{₹40} \times 100 = 11.83\%$

(c) Assuming the Ratio of Sales Volume be in 2:3:3 ratio. Let the Sales Volume of Year 1

{(2x × ₹20 × 0.909) + (3x × ₹20 × 0.826) + (3x × ₹20 × 0.751)} = 10,00,000

(36.36x + 4.956x+5.506x) = 10,00,000

$x = \frac{10,00,000}{130.98} = 7,635$ units

| | 1 | 2 | 3 |
|---|---|---|---|
| Min. Sales Volume p.a (7635 × 2/3) | 15,270 units | 22,905 units | 22,905 units |

Sensitivity of Sales Volume = $\frac{20,000 - 15,270}{20,000} \times 100 = 23.65\%$

or = $\frac{30,000 - 22,905}{30,000} \times 100 = 23.65\%$

(d) Sensitivity in Initial Outlay = $\frac{₹3,09,800}{₹10,00,000} \times 100 = 30.98\%$

(e) Discounted Payback Period

| Year | Cumulative P.V of Cash Inflows |
|---|---|
| 1 | 3,63,600 |
| 2 | 8,59,200 |
| 3 | 13,09,800 |

Discounted Payback Period = 2 Years + $\frac{1,40,800}{4,50,600}$ = 2.312years

Sensitivity of Life = $\frac{3 \text{ years} - 2.312 \text{ years}}{3 \text{ years}} \times 100 = 22.93\%$

**Solution.9: Calculation of Incremental Cash Inflows if the mechanised cleaning line is purchased:**

| | **Year 1 – 5** |
|---|---|
| | **(₹ Lakh)** |
| Annual Savings in operating cost (before tax) or Incremental CFBT | 15.00 |
| Less: Annual depreciation @ 20% on cost | (4.00) |
| Annual Incremental PBT | 11.00 |
| Less: Tax @ 35% | (3.85) |
| Annual Incremental PAT | 7.15 |
| Add: Annual depreciation | 4.00 |
| Annual Incremental CFAT | 11.15 |

| | |
|---|---|
| Present Value Factor (of an Annuity for a period of 5 years @ 10%) | 3.79 |
| **Present Value of First 5 years annual Incremental Cash Inflows** | **42.26** |
| | **Year 6 –10** |
| Annual Savings in operating cost (before tax) or Incremental CFBT | 15.00 |
| Less: Tax @ 35% | (5.25) |
| Annual Incremental CFAT | 9.75 |
| Present Value Factor (of an Annuity between year 6 to 10) | 2.35 |
| **Incremental Present Value of Annual Cash Inflows in years 6 to 10** | **22.91** |
| Calculation of Net Present Value: | |
| Aggregate Present Value of Cash in flows in years 1- 10 (42.26 + 22.91) | 65.17 |
| Less: Initial investment = Cost of machine | (20.00) |
| **NPV** | **45.17** |

**Conclusion:** Since the NPV is positive, it is advisable to purchase the mechanised line.

**Solution.10:** (a) **Workings:**

1. Kd = 12% (1 - 0.3) = 8.4%

2. Calculation of annual installment = ₹20,00,000 / 4.03735* = ₹4,95,374

*** Cumulative PVAF of 12% (0 to 4)**

**Statement showing segregation of Principal & Interest** **Amount in (₹)**

| Time | Opening Principal | Installment Paid | Interest Paid | Principal Paid |
|---|---|---|---|---|
| 0 | 20,00,000 | 4,95,374 | -- | 4,95,374 |
| 1 | 15,04,626 | 4,95,374 | 1,80,555 | 3,14,819 |
| 2 | 11,89,807 | 4,95,374 | 1,42,777 | 3,52,597 |
| 3 | 8,37,210 | 4,95,374 | 1,00,465 | 3,94,909 |
| 4 | 4,42,301 | 4,95,374 | 53,073 | 4,42,301 |

**Computation of PVCO of Buy Option**

| Particulars | Time | PVF | Amount (₹) | PV (₹) |
|---|---|---|---|---|
| Installment paid | 0 - 4 | 4.2828 | 4,95,374 | 21,21,588 |
| (-) Tax Savings on Interest | 1 | 0.9225 | (54,167) | (49,969) |
| | 2 | 0.8510 | (42,833) | (36,451) |
| | 3 | 0.7851 | (30,140) | (23,663) |
| | 4 | 0.7242 | (15,922) | (11,531) |
| (-) Tax Savings on depreciation | 1 | 0.9225 | (1,20,000) | (1,10,700) |
| | 2 | 0.8510 | (96,000) | (81,696) |
| | 3 | 0.7851 | (76,800) | (60,296) |
| | 4 | 0.7242 | (61,440) | (44,495) |
| | 5 | 0.6681 | (49,152) | (32,838) |
| (-) Terminal value | 5 | 0.6681 | (2,00,000) | (1,33,620) |
| **PVCO** | | | | **15,36,329** |

**Computation of PVCO of lease option**

| Particulars | Time | PVF | Amount (₹) | PV (₹) |
|---|---|---|---|---|
| Payment of Lease Rent | 0-4 | 4.2828 | 5,20,000 | 22,27,056 |
| (-) Tax Savings on Lease Rent | 1-5 | 3.9510 | (1,56,000) | (6,16,356) |
| **PVCO** | | | | **16,10,700** |

Net Advantage of Leasing = Benefit – Loss

= ₹15,36,329 – ₹16,10,700 = (-)₹74,371

(b) Let Annual Break Even Lease Rental payable at the beginning of each year for 5 years be X.

X x 4.2828 (-) 0.3X x 3.9510 = 15,36,329

X = 15,36,329 / 3.0975 = ₹4,95,990

**Solution.11:** (i) Calculation of loan installment:

₹10,00,000/(1 + PVIFA 12%, 4)

₹10,00,000/(1 + 3.038) = ₹2,47,647

**Debt Alternative: Calculation of Present Value of Outflows** **Amount in (₹)**

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|
| **End of year** | **Debt Payment** | **Interest** | **Dep.** | **Tax Shield [(3)+(4)]x0.3** | **Cash outflows (2) – (5)** | **PV factors @ 10%** | **PV** |
| 0 | 2,47,647 | 0 | 0 | 0 | 2,47647 | 1.000 | 2,47,647 |
| 1 | 2,47,647 | 90,282 | 1,60,000 | 75,085 | 1,72,562 | 0.909 | 1,56,859 |
| 2 | 2,47,647 | 71,398 | 1,60,000 | 69,419 | 1,78,228 | 0.826 | 1,47,216 |
| 3 | 2,47,647 | 50,249 | 1,60,000 | 63,075 | 1,84,572 | 0.751 | 1,38,614 |
| 4 | 2,47,647 | 26,305* | 1,60,000 | 55,892 | 1,91,755 | 0.683 | 1,30,969 |
| 5 | 0 | 0 | 1,60,000 | 48,000 | (48,000) | 0.621 | (29,808) |
| | | | | | | | 7,91,497 |
| Less: Salvage Value ₹2,00,000 x 0.621 | | | | | | | (1,24,200) |
| **Total Present Value of Outflow** | | | | | | | **6,67,297** |

*Balancing figure

**Leasing Alternative: Calculation of Present Value of Outflows**

Yrs. 1-5 ₹2,40,000 x (1 – 0.30) x 3.790 = ₹6,36,720

**Decision:** ABC Ltd. should take the asset on lease.

(ii) **From Lessor's Point of View**

| **Particulars** | | **Amount in (₹)** |
|---|---|---|
| Cost of Machine | | (-) 10,00,000 |
| PV of Post tax lease Rental (₹2,40,000 x 0.7 x 3.605) | 6,05,640 | |
| PV of Depreciation tax shield (₹1,60,000 x 0.3 x 3.605) | 1,73,040 | |
| PV of Salvage value (₹2,00,000 x 0.567) | 1,13,400 | 8,92,080 |
| **NPV** | | **(-) 1,07,920** |

**Decision:** Leasing proposal is not viable.