❑ Profitability Index Method

35. A project requires an initial investment of ₹ 6,00,000. The estimated life of the project is 5 years and it is expected that its annual cash inflows for the next 5 years will be ₹ 1,20,000, ₹ 1,60,000, ₹ 2,00,000, ₹ 2,40,000, and ₹ 80,000 respectively. If the rate of discounting is 15%, determine the profitability index.

Ans. GPI — 0.89 & NPI — (–) 0.11

36. A company is considering investment in a project that costs ₹ 2,50,000 with a working life of 5 years. It is expected that annual cash inflows of ₹ 50,000, ₹ 75,000, ₹ 90,000, ₹ 1,00,000 and ₹ 85,000 will be generated from the project at the end of 1st, 2nd, 3rd, 4th and 5th year respectively. If the discounting rate is 15%, calculate the profitability index.

Ans. GPI — 1.035 & NPI — 0.035 (Approx.)

❑ Comprehensive Problems

37. A company is contemplating to purchase a machine. Two machines A and B are available, each costing ₹ 5 lakh. In comparing the profitability of the machines, a discounting rate of 10% is to be used and machine is to be written off in five years by straight line method of depreciation with nil residual value. Cash inflow after tax are expected as follows :

Year	*Machine — A (₹ in Lakh)*	*Machine — B (₹ in Lakh)*
1	1.5	0.5
2	2.0	1.5
3	2.5	2.0
4	1.5	3.0
5	1.0	2.0

Indicate which machine would be profitable using the following methods of ranking investment proposals :

(i) Pay-back method *(ii) Net present value method*
(iii) Profitability index method *(iv) Average rate of return method* *[C.S. Final]*

Ans.

Techniques	Machine—A	Machine—B	Preferable
(i) Pay-back period	$2\frac{3}{5}$ years	$3\frac{1}{3}$ years	Machine—A
(ii) NPV	₹ 1,53,000	₹ 1,48,000	Machine—A
(iii) PI	1.306	1.296	Machine—A
(iv) ARR	14%	16%	Machine—B

38. Bright Metals Ltd. are considering two different investment proposals. The details are as under :

	Proposal A (₹)	*Proposal B* (₹)
Investment Cost	9,500	8,000
Estimated Income at the end of :		
Year I	4,000	8,000
Year II	4,000	8,000
Year III	4,500	12,000

(a) Suggest the most attractive proposal on the basis of excess present value method considering future incomes are discounted at 12%.

(b) Also find out the Internal Rate of Return of the two proposals.

The present value of ₹ 1 receivable at the end of each period on various rates of discount are :

Year	10%	11%	12%	13%	14%	15%	16%	17%	18%
1	0·9091	0·9009	0·8929	0·8850	0·8772	0·8696	0·8621	0·8547	0·8475
2	0·8265	0·8116	0·7972	0·7832	0·7695	0·7561	0·7432	0·7305	0·7182
3	0·7513	0·7312	0·7118	0·6931	0·6750	0·6575	0·6407	0·6244	0·6086

[I.C.W.A. Final]

Ans.

		Project—A	*Project—B*	*Preferable*
i) NPV	(₹)	464	2,063	Project—B
ii) IRR		14.76%	17.50%	Project—B

39. EEC Ltd. is considering the purchase of a machine. Two machines 'LM' and 'PM' are available each costing ₹ 1,00,000. Both machines will last for five years with no residual value. In comparing the profitability of machines, a discount rate of 10% is to be used. Earnings after taxation @ 40% and charging depreciation on straight line are expected to be as follows :

Year	LM (₹)	PM (₹)
1	10,000	10,000 (loss)
2	20,000	10,000
3	30,000	20,000
4	10,000	40,000
5	Nil	20,000

Indicate which machine would be a more profitable investment under the various methods of ranking investment proposals, *viz*, ARR, Pay-back, NPV and Profitable Index (PI).

Note : Present value interest factor @ 10% per annum.

Period	:	0	1	2	3	4	5
Factor	:	1·000	0·909	0·826	0·751	0·683	0·621

[C.S. Final]

IRR → 20.26 %
17.98%

Ans.

	Machine—LM	*Machine—PM*	*Preferable*
ARR	14%	16%	Machine—PM
Pay-back period	$2\frac{3}{5}$ years	$3\frac{1}{3}$ years	Machine—LM
NPV (₹)	30,770	29,730	Machine—LM
PI	1.308	1.2973	Machine—LM

40. The initial outlay of the project is ₹ 1,00,000 and it generates cash inflow of ₹ 50,000, ₹ 40,000, ₹ 30,000, and ₹ 20,000 in the four years of its life span.

You are required to calculate (i) Net Present Value (NPV) ; (ii) Profitability Index (PI) ; and (iii) Pay-back period of the project assuming 10% rate of discount.

Note : Present Value of Re. 1 due at the end of n period at d rates.

Year / Rate	*5%*	*10%*	*15%*	*20%*
1	0·9524	0·9091	0·8696	0·8333
2	0·9070	0·8264	0·7561	0·6944
3	0·8638	0·7513	0·6575	0·5787
4	0·8227	0·6830	0·5718	0·4823
5	0·7835	0·6209	0·4972	0·4019

[C.S. Final]

Ans. i) NPV — ₹ 14,710 ii) PI – 1.1471 iii) Pay-back period — $2\frac{1}{3}$ years

42. A company has an investment project costing ₹ 40,000 with the following expected Net Cash Flow (*i.e. after tax and before depreciation*) :

Year	:	1	2	3	4	5
Net cash flow (₹)	:	7,000	7,000	7,000	7,000	7,000
		6	7	8	9	10
		8,000	10,000	15,000	10,000	4,000

Using 10% as the cost of capital (*rate of discount*) determine the following :

(i) Pay-back period ; (ii) Net present value at 10% discount factor ;

(iii) Profitability index at 10% discount factor ;

(iv) Internal rate of return with the help of 10% discount factor and 15% discounting factor.

Present value of ₹ 1 :

Year	:	1	2	3	4	5
at 10%	:	0·909	0·826	0·751	0·683	0·621
at 15%	:	0·870	0·756	0·658	0·572	0·497
		6	7	8	9	10
		0·564	0·513	0·467	0·424	0·386
		0·432	0·376	0·327	0·284	0·247

[C.A. Final]

Ans. (i) Pay-back period : $5\frac{5}{8}$ years (ii) NPV : ₹ 8,961 (iii) PI : 1·224 (iv) IRR : ₹ 14·7%

45. Using the information given below, compute the pay-back period under (a) Traditional pay-back method, (b) Discounted pay-back method, and comment on the results :

Initial outlay		₹ 80,000
Estimated life		5 years
Profit after tax :		₹
End of year	1	6,000
	2	14,000
	3	24,000
	4	16,000
	5	Nil

Depreciation has been calculated under the straight line method. The cost of capital may be taken at 20% p.a. and the present value of ₹ 1 and at 20% p.a. given below :

Year	:	1	2	3	4	5
PV factor	:	0·83	0·69	0·58	0·48	0·40

[C.U. M. Com.]

Ans. (i) Traditional pay-back period : 2.7 years
(ii) Discounted pay-back period : 4.39 years

46. Your company can make either of two investments at the beginning of 2004, the particulars of which are given below :

Particulars			*Project—A*	*Project—B*
Estimated cost (*to be incurred initially*)		₹	20,000	28,000
Estimated life		(*Years*)	4	5
Scrap value at the end of estimated life			Nil	Nil
Estimated net cash flow				
End of	2004	(₹)	5,500	5,600
	2005		7,000	9,000
	2006		8,500	9,000
	2007		7,500	9,000
	2008		—	9,000

It is estimated that each of the alternative projects will require an additional working capital of ₹ 2,000 which will be received back in full after the expiry of each project life.

Cost of finance to your company may be taken at 10% p.a. The present value of Re. 1 to be recovered at the end of each year, at 10% is given below :

Year	:	1	2	3	4	5
PV	:	0·91	0·83	0·75	0·68	0·62

Evaluate the investment proposals using (i) Net Present Value and (ii) Profitability Index Method.

[ICWA Final]