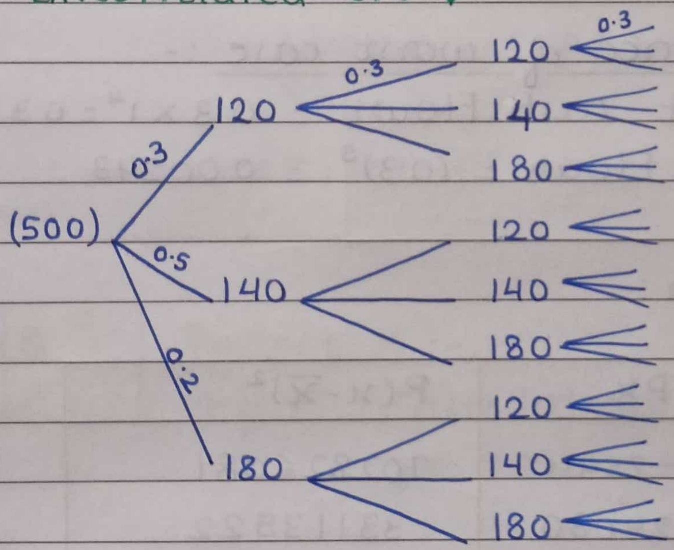
* Type 1 :- PROBABILITY TREE :-

	0.3	0.5	0.2	(5 years)
II	(500)	(500)	(500)	
CFAT	120	140	180	
SV @ t=5	40	50	60	

• Perfectly Correlated CFs ↴

Year →		1	2	3	4	5	Joint Prob.
(500)	0.3	120	120	120	120	120+40	0.3
	0.5	140	140	140	140	140+50	0.5
	0.2	180	180	180	180	180+60	0.2

• Uncorrelated CFs ↴



Imp....

Q.5

① Expected after tax cash inflow p.a.

$= 100000 \times 0.3 + 110000 \times 0.5 + 120000 \times 0.2$

$= 109000$

② Expected Salvage Value

$= 20000 \times 0.3 + 50000 \times 0.5 + 60000 \times 0.2$

$= 43000$

Ans : a] Expected NPV

$= 109000 \times PVAF(10\%, 5) + 43000 \times PVIF(10\%, 5) - 400000$

$= 109000 \times 3.791 + 43000 \times 0.621 - 400000$

$= 39922$

Ans : b] Best case NPV

$= 120000 \times 3.791 + 60000 \times 0.621 - 400000$

$= 92180^{*}$

Worst case NPV

$= 100000 \times 3.791 + 20000 \times 0.621 - 400000$

$= -8480^{\#}$

Ans : c] Probability of occurence of worst case :-

(i) Perfectly dependent cash Flows $= 0.3 \times 1^4 = 0.3$

(ii) Independent cash Flows $= (0.3)^5 = 0.00243$

Ans : d] Using Path Approach :-

Path	Joint Prob. (P)	NPV (x)	Px	$P(x-\bar{x})^2$
worst 1	0.3	-8480#	-2544	702826081
2	0.5	48060*	24030	33113522
Best 3	0.2	92180*	18436	546179713
			39922	$1282119316 = \sigma^2$

(*) $110000 \times 3.791 + 50000 \times 0.621 - 400000 = 48060$

σ of NPV $= \sqrt{1282119316} = 35807$

Coefficient of Variation $= \frac{\sigma}{\bar{x}} = \frac{35807}{39922} = 0.8969$

$= 89.69\%$

Ans: e] RADR = kc - 1 = 10 - 1 = 9%

Expected NPV = 109000 × PVAF (9%, 5) + 43000 × df (9%, 5) - 400000
= 51919

The project should be accepted.

→ Self Note:-

The sum is conceptually wrong. 10% which was given in the sum should be taken as Rf & kc should have been separately given, say 15%. So, we would do the 1st 4 parts of the sum using Rf = 10%.

In the 5th part - RADR = 15% - 1% = 14%.

Hence, Expected NPV
= 109000 × PVAF (14%, 5) + 43000 × df (14%, 5) - 400000
= 3461.32

∴ Project should be accepted.

Q.4

Project X :-

Step 1: Calculation of Mean & Variance of Cash Flow for each year.

Year 1				Year 2				Year 3			
CF(x)	P	Px	$P(x-\bar{x})^2$	CF	P	Px	$P(x-\bar{x})^2$	CF	P	Px	$P(x-\bar{x})^2$
30	0.3	9	102.6	30	0.3	9	39.67	30	0.3	9	21.67
50	0.4	20	0.9	40	0.4	16	0.9	40	0.4	16	0.9
65	0.3	19.5	81.6	55	0.3	16.5	54.67	45	0.3	13.5	12.67
		CF_1 = 48.5	σ_1^2 = 185.25			CF_2 = 41.5	σ_2^2 = 95.25			CF_3 = 38.5	σ_3^2 = 35.25

Step 2: Expected NPV :-

Years	Expected CF	Df @ 10%	Present value
1	48.5	0.909	44.09
2	41.5	0.826	34.29
3	38.5	0.751	28.92
			107.30
		(-) Initial Inv.	70.00
		Expected NPV	37.30

Project Y :-

Cash Flow	Prob.	Px	$P(x-\bar{x})$
40	0.2	8	6.05
45	0.5	22.5	0.125
50	0.3	15	6.075
		$\overline{CF} = 45.5$	$\sigma^2 = 12.25$

Expected NPV = 45.5 × PVAF (10%, 3) − 80 = 33.15
(Assumption : project Y is of 3 years)

Ans: a] Based on expected NPV, Project X is better.

Ans: b] We will assume that CFs are independent & apply Hillier's Model -

Project X :

Years (t)	$\sigma^2 t$	Df for 2t years @10%	Present Value
1	185.25	0.826	153.0745
2	95.25	0.683	65.0557
3	35.25	0.564	19.8810
			$237.95325 = \sigma^2$

$\therefore \sigma = 15.43$

Project Y :

$\sigma_1^2 = \sigma_2^2 = \sigma_3^2 = 12.25$

Discount rate for 2 years $= (1.10)^2 - 1 = 21\%$ per 2 years

$\therefore \sigma NPV = \sqrt{12.25 \text{ PVAF } (21\%, 3)} = 5.04$

(2 yearly annuity of 12.25 for 3 periods)

	Project X	Project Y
Expected NPV	37.3 ✓	33.15
σ NPV	15.43	5.04 ✓
$CV = \frac{\sigma}{\bar{x}} \times 100$	41.37%	15.20% ✓

<u>Analysis</u> :
- Based on expected NPV, Project X is better.
- Based on S.D., Project Y is better.
- So, final decision should be based on coefficient of Variation. Project Y has lower coefficient of variation.

$\therefore$ <u>Project Y should be chosen.</u>

Q.1

icai :- Can u calculate S.D. of P.I. ? → yes.

kaise ?

Prof. Index (x)	Prob. (P)	Px	$P(x-\bar{x})$

Q.2

Q.3

clean sum.

Total Paths $= 4^3 = 64$

Prob. of worst path NPV $= 0.1 \times 0.1 \times 0.2 = 0.002$

Prob. of best NPV $= 0.3 \times 0.2 \times 0.1 = 0.006$