7. RISK ANALYSIS IN CAPITAL BUDGETING

ASSIGNMENT SOLUTIONS

PROBLEM NO: 1

Estimation of Expected Net Cash Flows:

Assumption (1)	Cash Flows (Rs.) (2)	Probability (3)	Expected cash flow(2x3) (Rs.)
Best guess	9,00,000	0.3	9,00,000 × 0.3 = 2,70,000
High guess	5,00,000	0.4	5,00,000 × 0.4 = 2,00,000
Low guess	2,00,000	0.3	2,00,000 × 0.3 = 60,000
Expected Net cash flow (ENCF)			= 5,30,000

PROBLEM NO: 2

Expected Investment: (Rs. 70,00,000 x 0.20) + (Rs. 80,00,000 x 0.40) + (Rs. 90,00,000 x 0.40)

= Rs.14,00,000 + Rs.32,00,000 + Rs.36,00,000 = Rs.82,00,000

PROBLEM NO: 3

No. of units (1)	Selling Price (2)	Probability (3)	Expected Selling Price (4)	Variable Cost (5)	Probability (6)	Expected Variable Cost (7)	Expected Cash Flow (Rs.) {1 x (4 - 7)}
40,000	10	0.3	3	5	0.25	1	80,000
40,000	20	0.4	8	10	0.35	3.5	1,80,000
40,000	30	0.3	9	15	0.40	6	1,20,000
Expected Cash Inflows							3,80,000
Less: Fixed Cost (P.a)							(1,20,000)
Less: Annual Depreciation							(50,000)
EBIT/ EBT							2,10,000
Less: Taxes @ 50%							(1,05,000)
EAT							1,05,000
Add: Depreciation							50,000
Expected CFAT							1,65,000

Note: Students are advised to rectify the hint answer given in our material

PROBLEM NO: 4

Possible event	Project A			Project B		
	Net cash Flows (Rs.)	probability	Expected value	Net Cash Flows (Rs.)	probability	Expected Value (Rs.)
A	5,000	0.20	1,000	15,000	0.10	1,500
B	8,000	0.10	800	19,000	0.15	2,850
C	10,000	0.50	5,000	16,000	0.50	8,000
D	13,000	0.10	1,300	12,000	0.15	1,800
E	15,000	0.10	1,500	10,000	0.10	1,000
ENCF			9,600			15,150

The Net Present Value of Project A is (0.893 x Rs. 9,600 - Rs. 9,000) = Rs.427

The Net Present Value of Project B is (0.893 x Rs. 15,150 - Rs. 10,000) = Rs. 4,529

Project B is preferable

Note: Students are advised to rectify the hint answer given in our material.

PROBLEM NO: 5

Year 1			Year 2			Year 3		
Cash Flow (Rs.)	Probability	Expected Value (Rs.)	Cash Flow (Rs.)	Probability	Expected Value (Rs.)	Cash Flow (Rs.)	Probability	Expected Value (Rs.)
3,000	0.1	300	4,000	0.3	1,200	5,000	0.4	2,000
6,000	0.2	1,200	6,000	0.4	2,400	10,000	0.2	2,000
9,000	0.3	2,700	9,000	0.2	1,800	13,000	0.1	1,300
12,000	0.4	4,800	12,000	0.1	1,200	16,000	0.3	4,800
ENCF		9,000			6,600			10,100

The present value of the expected value of cash flow at 10% discount rate has been determined as follows:

$$\text{Present Value of Cash Flow} = \frac{ENCF_1}{(1+k)^1} + \frac{ENCF_2}{(1+k)^2} + \frac{ENCF_3}{(1+k)^3} = \frac{9,000}{(1.12)^1} + \frac{6,600}{(1.12)^2} + \frac{10,100}{(1.12)^3}$$

= 9,000 x 0.893 + 6,600 x 0.797 + 10,100 x 0.712 = Rs. 20,488

Expected Net Present Value = Present Value of Cash Flow - Initial Investment

= Rs. 20,488 - Rs. 15,000 = Rs. 5,488

PROBLEM NO: 6

Estimation of Variance, Standard Deviation(s) & Co-efficient of variation of each of the projects:

Possible Event	Project M					Project N				
	Cash Flow (Rs.) (x)	Probability	Expected Cash Flow	d_M	$P d_M^2$	Cash Flow (Rs.) (x)	Probability	Expected Cash Flow	d_N	$P d_N^2$
P	12,000	0.10	1,200	-6,000	36,00,000	14,000	0.30	4,200	-3,400	34,68,000
Q	15,000	0.30	4,500	-3,000	27,00,000	16,000	0.20	3,200	-1,400	3,92,000
R	18,000	0.20	3,600	0	0	18,000	0.20	3,600	600	72,000
S	21,000	0.30	6,300	3,000	27,00,000	20,000	0.10	2,000	2,600	6,76,000
T	24,000	0.10	2,400	6,000	36,00,000	22,000	0.20	4,400	4,600	42,32,000
			18,000		1,26,00,000			17,400		88,40,000

Standard deviation for Project M = $\sqrt{1,26,00,000}$ = 3,549.64

Standard deviation for Project N = $\sqrt{88,40,000}$ = 2,973.21

Projects	Coefficient of variation	Risk
M	$\frac{3,549.64}{18,000} = 0.1972$	More
N	$\frac{2,973.21}{17,400} = 0.1708$	Less

Conclusion: Project N should be selected.

Note: Students are advised to rectify the hint answer given in our material

PROBLEM NO: 7

The expected Value of cash flows of project X and Y may be calculated as follows:

Project X = 2,000 (0.3) + 4,000 (0.4) + 6,000 (0.3) = 4,000

Project Y = 1,000 (0.1) + 3,000 (0.1) + 5,000 (0.4) + 7,000 (0.3) + 9,000 (0.1) = 5,400

Now the standard deviations of two projects may be calculated as follows:

Project X				Project Y			
CF(Rs.)	EVCF	Prob.	$P(CF-EVCF)^2$	CF(Rs.)	EVCF	Prob.	$P(CF-EVCF)^2$
2,000	4,000	0.3	12,00,000	1,000	5,400	0.1	19,36,000
4,000	4,000	0.4	0	3,000	5,400	0.1	5,76,000

6,000	4,000	0.3	12,00,000	5,000	5,400	0.4	64,000
				7,000	5,400	0.3	7,68,000
				9,000	5,400	0.1	12,96,000
			24,00,000				46,40,000

Now, the standard deviation of Project X is square root of 24,00,000 i.e., 1,549 and the standard deviation of project Y is the Square root of 46,40,000 i.e., 2,154. Between these two projects X and Y, the project Y is having higher expected value of cash flows i.e., 5,400. However, it also has a higher standard deviation of 2,154 signifying that the cash flows of project X. Had the expected values of cash flows of both the projects were same, the firm must have a preference for project X. Moreover, the decision in favor of Project X would hold good as both the projects are of equal size and require equal amount of cash outlays. As the expected value of cash flows from these two projects are not same, therefore, the standard deviation as measure of risk will not help much. The reason being that the standard deviation is an absolute measure of risk and represents the risk in terms of the measuring unit i.e. Rupee amount. To resolve such dilemma, another measure known as the coefficient of variation may be used.

Coefficient of Variation: A Relative measure of Risk: Coefficient of Variation (CV) is a relative measure of dispersion and can be applied in capital budgeting decision process to measure the risk of a project particularly in case when the alternative projects are of different sizes. The CV is defined as the standard deviation of the probability distribution divided by its expected value.

PROBLEM NO: 8

SOUTH PROJECT:

i) Computation of Expected NPV & Standard Deviation

NPV(X)	Probability	Expected NPV (X)	D_x (X-X□)	D_x^2	PD_x^2
3	0.05	0.15	-4.8	23.04	1.152
5	0.30	1.50	-2.8	7.84	2.352
6	0.30	1.80	-1.8	3.24	0.972
12	0.30	3.60	4.2	17.64	5.292
15	0.05	0.75	7.2	51.84	2.592
		X = 7.80			ΣPdx^2=12.36

Standard Deviation of South Project= $\sqrt{\sum Pdx^2} = \sqrt{12.36}$ σ NPV=3.516

ii)

NPV(X)	Probability	Expected NPV	D_x (X-X□)	D_x^2	PD_x^2
3	0.15	0.45	-4.8	23.04	3.456
5	0.25	1.25	-2.8	7.84	1.960
6	0.25	1.50	-1.8	3.24	0.810
12	0.25	3.00	4.2	17.64	4.41
15	0.10	1.60	7.2	51.84	5.184
		7.80			ΣPdx^2=15.82

Standard Deviation = $\sqrt{\Sigma Pdx^2} = \sqrt{15.82}$ = σ NPV = 3.977

iii) Risker: Since σ NPV for North project is more than the σ NPV of the South project. North project is considered as a Riskers project.

PROBLEM NO: 9

i) On the basis of standard deviation project X be chosen because it is less risky than Project Y having higher standard deviation.

ii) $CV_X = \frac{SD}{ENPV} = \frac{40,000}{60,000} = 0.67$

$CV_Y = \frac{SD}{ENPV} = \frac{1,35,000}{2,27,000} = 0.595$

On the basis of Co-efficient of Variation (C.V.) Project X appears to be more risky and Y should be accepted.

iii) However, the NPV method in such conflicting situation is best because the NPV methods in compatibility of the objective of wealth maximization in terms of time value. (Project Y is suggestable under this method)

PROBLEM NO: 10

a) Using risk - free rate

Year	Cash flows (inflows) Rs.)	PV Factor at 10%	PV of Cash flows (in flows)
1	40,000	0.909	36,360
2	50,000	0.826	41,300
3	15,000	0.751	11,265
4	30,000	0.683	20,490
PV of Cash inflows			1,09,415
Less: PV of Cash outflows			(1,00,000)
NPV			**9,415**

b) Using risk - adjusted discount rate

Year	Cash flows (inflows) Rs.)	PV Factor at 10%	PV of Cash flows (in flows)
1	40,000	0.833	33,320
2	50,000	0.694	34,700
3	15,000	0.579	8,685
4	30,000	0.482	14,460
PV of Cash inflows			91,165
Less: PV of Cash outflows			(1,00,000)
NPV			(8,835)

- The project would be acceptable when no allowance is made for risk. But it will not be acceptable is risk premium is added to the risk free rate. It moves from positive NPV to negative NPV.
- If the firm were to use the internal rate of return, then the project would be accepted when IRR is greater than the risk - adjusted discount rate.

PROBLEM NO: 11

Determination of cost of debt and equity:

Volume of Debt and Equity at 50:50 works out to Rs. 1100 lakhs each. **(Rs. in Lakhs)**

Debt	1st Slab	2nd Slab	3rd Slab	4th Slab
Volume of funds	500	500	100	1100
Rate	10%	12%	15.72%	
Interest cost	50	60	15.72	125.72
Tax saving 30%				37.72
Post-tax cost (Int-tax)				88.00

Determination of weighted marginal cost of capital

Source	Cost %	Weight	Weight x Cost %
Debt	8.00	0.50	4.00
Equity	12.00	0.50	6.00
WMCC (cut-off rate)		1.00	10.00

Risk Adjusted rate = Cut off rate + Risk Premium = 10 + 2 = 12%

PROBLEM NO: 12

Statement showing the determination of the risk adjusted Net Present Value:

Projects	Net cash outlays (Rs.)	Coefficient of variation	Risk adjusted discount rate	Annual Cash inflow (Rs.)	PV factor 1-5 years	Discounted cash inflow (Rs.)	Net present value (Rs.)
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii) = (v) × (vi)	(viii) = (vii) – (ii)
X	4,00,000	1.6	18%	2,00,000	3.127	6,25,400	2,25,400
Y	1,80,000	2.0	22%	80,000	2.864	2,29,120	49,120
Z	2,50,000	1.2	16%	1,25,000	3.274	4,09,250	1,59,250

PROBLEM NO: 13

Determination of NPV:

Year	Expected CFAT	Certainty equivalent (CE)	Adjusted CFAT (CFAT X CE)	PV factor (at 0.06)	Total PV
0	(Rs. 2,00,000)	1.0	Rs.(2,00,000)	1.000	(Rs.2,00,000)
1	Rs. 1,60,000	0.8	Rs.1,28,000	0.943	Rs.1,20,704
2	Rs. 1,40,000	0.7	Rs.98,000	0.890	Rs.87,220
3	Rs. 1,30,000	0.6	Rs.78,000	0.840	Rs.65,520
4	Rs. 1,20,000	0.4	Rs.48,000	0.792	Rs.38,016
5	Rs. 80,000	0.3	Rs.24,000	0.747	Rs.17,928
NPV					1,29,388

Since NPV is positive the project should be accepted.

PROBLEM NO: 14

NPV = 10,00,000 (0.90) / (1.05) + 15,00,000 (0.85) / $(1.05)^2$ + 20,00,000 (0.82) / $(1.05)^3$ + 5,00,000 (0.78) / $(1.05)^4$ - 45,00,000 = Rs.5,34,570

PROBLEM NO: 15

Part I:

Step 1: Ascertain the discount rate.

When CE approach is adopted, risk-free rate (i.e., 8% in this case) is relevant.

Step 2: Compute NPV of the project X

Year	Cash flow (Rs.)	Certainty factor	Certain cash flow (Rs.)	DF @ 8%	PV of cash flows (Rs.)
0	(3,40,000)	1.0	(3,40,000)	1.000	(3,40,000)
1	1,80,000	0.8	1,44,000	0.926	1,33,344
2	2,00,000	0.7	1,40,000	0.857	1,19,980
3	2,00,000	0.5	1,00,000	0.794	79,400
					NPV (7,276)

Statement showing NPV of Project Y

Year	Cash flow (Rs.)	Certainty factor	Certain cash flow (Rs.)	DF @ 8%	PV of cash flows (Rs.)
0	(3,30,000)	1.0	(3,30,000)	1.000	(3,30,000)
1	1,80,000	0.9	1,62,000	0.926	1,50,012
2	1,80,000	0.8	1,44,000	0.857	1,23,408
3	2,00,000	0.7	1,40,000	0.794	1,11,160
					NPV = 54,580

Step 3: Decision: Since the NPV of project X is negative it should be rejected. Since the NPV of project Y is positive, it should be accepted.

PART II: Project for which RADR will be applied

Since the CE coefficient is lower in project X, it is deemed to be riskier than Project Y. Project X should, therefore, be evaluated by using RADR of 10%.

PROBLEM NO: 16

NPV= -1,25,000 + [(100 - 30) 2,000 - 1,00,000] x 3.791= Rs. 26,640

Sensitivity to changes to

1.	Selling price	
	125,000 = [(P - 30) 2,000 - 100,000] X 3.791	Alternatively
	32,973 = 2,000 P - 60,000 - 100,000	Rs. 26,640
	P = 96.49	2,000 x Rs. 100 x 3.791
	i.e. fall of 3.51% $\left[\frac{96.49 - 100}{100}\right]$ before NPV is zero.	

2.	Variable costs	
	1,25,000 = [(100 - v) 2,000 - 1,00,000] X 3.791	Alternatively
	32,973 = 2,00,000 - 2,000V - 1,00,000	Rs. 26,640
	V = 33.51	2,000 x Rs. 30 x 3.791
	i.e. increase of 11.71% $\frac{33.51 - 30}{30}$ before NPV is zero.	
3.	Volume	
	1,25,000 =[(100 - 30) q - 1,00,000] X 3.791	Alternatively
	32,973 =70q - 100,000	Rs. 26,640
	q = 1,900	2,000 x Rs.(100 - 30) x 3.791
	in fall of 5.0% $\frac{1,900-2,000}{2,000}$ before NPV is zero.	
4.	Initial cost	Alternatively
	Rs. (1,25,000 + 26,640) = Rs. 151,640	Rs. 26,640
	i.e. increase of 21.31% $\frac{1,51,640 - 1,25,000}{1,25,000}$ before NPV is zero.	Rs. 1,25,000
5.	Fixed costs	Alternatively
	125,000 = [(Rs. 100 - Rs. 30) 2,000 - F] X 3.791	Rs. 26,640
	32,973 =1,40,000 - F	Rs. 1,00,000 x 3.791
	F =1,07,027	
	i.e. an increase of 7.03% $\frac{1,07,027 - 1,00,000}{1,00,000}$ before NPV is zero	
6.	Life	
	Rs. 1,25,000 = Rs. 40,000 x AF_n @ 10%	
	3.125 =AF_n @ 10%	
	AF for 4 years at 10% is 3.17	
	i.e. life can fall to approximately 4 years before NPV is zero.	
7.	Discount rate	
	3.125 = AF for 5 years @ x %	
	From tables AF for 5 year @ 18% is 3.127, so x is approximately 18%	
	i.e. an increase of 80% $\frac{18\% - 10\%}{10\%}$ before NPV is zero.	

PROBLEM NO: 17

Calculation of NPV through Sensitivity Analysis:

Particulars	Amount (Rs.)
PV of cash inflows (Rs. 60,00,000 × 3.791)	2,27,46,000
Initial Project Cost	2,00,00,000
NPV	27,46,000

Situation	NPV	Changes in NPV
Base (Present)	Rs. 27,46,000	
If initial project cost is varied adversely by 10%	(Rs. 2,27,46,000 - Rs. 2,20,00,000*) = Rs. 7,46,000	$\frac{(Rs.\ 27,46,000 - Rs.\ 7,46,000)}{Rs.\ 27,46,000}$ = (72.83%)
If annual cash inflow is varied adversely by 10%	[Rs. 54,00,000 (revised cash flow) ** × 3.791) - (Rs. 2,00,00,000)] = Rs. 4,71,400	$\frac{(Rs.\ 27,46,000 - Rs.\ 4,71,400)}{Rs.\ 27,46,000}$ = 82.83%
If cost of capital is varied adversely by 10% i.e. it becomes 11%	(Rs. 60,00,000 × 3.696) - Rs. 2,00,00,000 = Rs. 21,76,000	$\frac{(Rs.\ 27,46,000 - Rs.\ 21,76,400)}{Rs.\ 27,46,000}$ = 20.76%

*Revised initial project Cost = 2,00,00,000 × 110% = 2,20,00,000

**Revised Cash Flow = Rs. 60,00,000 x (100 - 10) % = Rs. 54,00,000

Conclusion: Project is most sensitive to 'annual cash inflow'.

PROBLEM NO: 18

P.V. of Cash Flows:

Year 1	Running Cost	Rs. 4,000 x 0.917	=(Rs. 3,668)
	Savings	Rs. 12,000 x 0.917	=(Rs. 11,004)
Year 2	Running Cost	Rs. 5,000 x 0.842	= (Rs. 4,210)
	Savings	Rs. 14,000 x 0.842	= (Rs. 11,788)
			Rs. 14,914
Year 0	**Less:** P.V. of Cash Outflow	Rs.10,000 x 1	=(Rs. 10,000)
		NPV	Rs. 4,914

Sensitivity Analysis:

i) Increase of Plant Value by Rs. 4,914

$$\frac{4,914}{10000} x100 = 49.14\%$$

ii) Increase of Running Cost by Rs. 4,914

$$\frac{4,914}{3,668 + 4,210} = \frac{4,914}{7,878} x100 = 62.38\%$$

iii) Fall in Saving by Rs. 4,914

$$\frac{4,914}{11,004 + 11,788} = \frac{4,914}{22,792} x100 = 21.56\%$$

Hence, savings factor is the most sensitive to affect the acceptability of the project as in Comparison of other two factors as a slight % change in this factor shall more affect the NPV than others

Alternative Solution:

Year 1	Running Cost	Rs. 4,000 x 0.917	= (Rs 3,668)
	Savings	Rs. 12,000 x 0.917	= (Rs. 11,004)
Year 2	Running Cost	Rs. 5,000 x 0.842	= (Rs. 4,210)
	Savings	Rs. 14,000 x 0.842	= (Rs. 11,788)
			Rs. 14,914
Year 0	**Less:** P.V. of Cash Outflow	Rs.10,000 x 1	= (Rs. 10,000)
		NPV	Rs. 4,914

Analysis:

Sensitivity:

i) If the initial project cost is varied adversely by say 10%*.

NPV (Revised) (Rs.4,914 - Rs.1,000) = Rs.3,914

$$\text{Change in NPV } \frac{Rs.4,914 - Rs.3,914}{Rs.4914} = 20.35\%$$

ii) If annual Running cost is varied by say 10%*.

NPV (Revised) (Rs.4,914 - Rs.400 x 0.917 - Rs.500 x 0.843)

= Rs.4,914 - Rs.367 - Rs.421 = Rs.4,126

$$\text{Change in NPV } \frac{Rs.4,914 - Rs.4,126}{Rs.4914} = 16.04\%$$

iii) If saving is varied by say 10%.

NPV (Revised) (Rs.4,914 - Rs.1,200 x 0.917 - Rs.1,400 x0.843)

= Rs.4,914 - Rs.1,100 - Rs.1,180 = Rs.2,634

$$\text{Change in NPV } \frac{Rs.4,914 - Rs.2,634}{Rs.4914} = 46.40\%$$

Hence, savings factor is the most sensitive to affect the acceptability the project.

- Any % of variation other than 10% can also be assumed.

PROBLEM NO: 19

i) Step - 1:

The expected cash flows of the project are as follows:

Year	P_r = 0.2 (Rs.)	P_r = 0.6 (Rs.)	P_r = 0.2 (Rs.)	Total (Rs.)	PVF	Cash flow (Rs.)
0	(1,00,000)	(3,00,000)	(1,00,000)	(5,00,000)	1	(5,00,000)
1	30,000	1,20,000	50,000	2,00,000	0.8	1,60,000
2	30,000	1,20,000	50,000	2,00,000	0.64	1,28,000
3	30,000	1,20,000	50,000	2,00,000	0.512	1,02,400
4	30,000	1,20,000	50,000	2,00,000	0.4096	81,920
4	10,000	60,000	30,000	1,00,000	0.4096	40,960
NPV based on expected cash flows would be as follows						13,280

Alternatively:

NPV = 2,00,000 x (PVAF) +PV of terminal cash flow - PV of cash out flow

= 2,00,000 x (25%, 4 yrs.) +(1,00,000 x 0.4096) - 5,00,000

= 4,72,320 + 40,960 - 5,00,000

= 5,13,280 - 5,00,000

= 13,280

ii) For the worst case, the cash flows from the cash flow column farthest on the left are used to calculate NPV

$$= -\text{Rs.}5{,}00{,}000 + \frac{\text{Rs.}1{,}50{,}000}{(1+0.25)^1} + \frac{\text{Rs.}1{,}50{,}000}{(1+0.25)^2} + \frac{\text{Rs.}1{,}50{,}000}{(1+0.25)^3} + \frac{\text{Rs.}1{,}50{,}000}{(1+0.25)^4} + \frac{\text{Rs.}50{,}000}{(1+0.25)^4}$$

= - Rs. 5,00,000 + Rs. 1,20,000 + Rs. 96,000 + Rs. 76,800 + Rs. 61,440 + Rs. 20,480

NPV = - Rs. 1,25,280

For the best case, the cash flows from the cash flow column farthest on the right are used to calculated NPV.

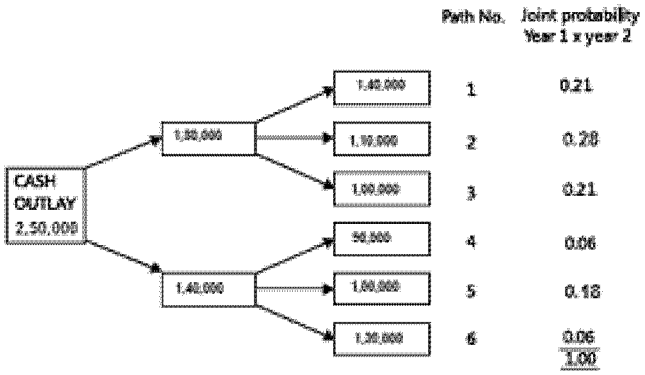
$$= -\text{Rs.}5{,}00{,}000 + \frac{\text{Rs.}2{,}50{,}000}{(1+0.25)^1} + \frac{\text{Rs.}2{,}50{,}000}{(1+0.25)^2} + \frac{\text{Rs.}2{,}50{,}000}{(1+0.25)^3} + \frac{\text{Rs.}2{,}50{,}000}{(1+0.25)^4} + \frac{\text{Rs.}1{,}50{,}000}{(1+0.25)^4}$$

= - Rs.5,00,000 + Rs. 2,00,000 + Rs. 1,60,000 + Rs. 1,28,000 + Rs. 1,02,400 + Rs. 61,440

NPV = Rs. 1,51,840

PROBLEM NO: 20

i) The decision tree diagram is presented in the chart, identifying various paths and outcomes, and the computation of various paths/outcomes and NPV of each path are presented in the following tables:



The Net Present Value (NPV) of each path at 15% discount rate is given below:

Path	Year 1 Cash Flows (Rs.)	Year 2 Cash Flows (Rs.)	Total Cash Inflows (PV) (Rs.)	Cash Outflows (Rs.)	NPV (Rs.)
1	1,80,000 × 0.87 = 1,56,600	1,40,000 × 0.756 = 1,05,840	2,62,440	2,50,000	12,440
2	1,56,600	1,10,000 × 0.756 = 83,160	2,39,760	2,50,000	(10,240)
3	1,56,600	1,00,000 × 0.756 = 75,600	2,32,200	2,50,000	(17,800)
4	1,40,000 × 0.87 = 1,21,800	90,000 × 0.756 = 68,040	1,89,840	2,50,000	(60,160)
5	1,21,800	1,00,000 × 0.756 = 75,600	1,97,400	2,50,000	(52,600)
6	1,21,800	1,20,000 × 0.756 = 90,720	2,12,520	2,50,000	(37,480)

Statement showing Expected Net Present Value

S.No	NPV (Rs.)	Joint Probability	Expected NPV (Rs.)
1	12,440	0.21	2,612.4
2	(10,240)	0.28	(2,867.20)
3	(17,800)	0.21	(3,738)
4	(60,160)	0.06	(3,609.6)
5	(52,600)	0.18	(9,468)
6	(37,480)	0.06	(2,248.8)
			(19,319.2) = 19,319

ii) If the worst outcome is realized the project will yield NPV of Rs. (60,160). The probability of occurrence of this NPV is 6% (Path 4).

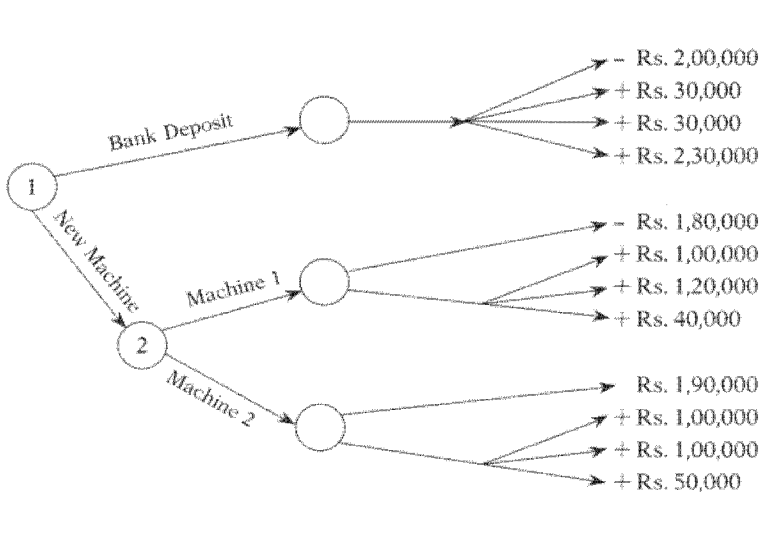
iii) The best outcome will be path 1 when the NPV is at Rs. 12,440. The probability of occurrence of this NPV is 21%.

iv) The project should be rejected because the Expected NPV is Negative at Rs. 19,319.

Note: Students are advised to rectify the hint answer given in our material.

PROBLEM NO: 21

The above situation can be presented in the form of a decision tree as given in Figure:



	PVF @ 15%	PV (Rs.)
	1.000	–2,00,000
	.870	+ 26,100
	.756	+ 22,680
	.658	+ 1,51,340
	NPV =	120
	1.000	–1,80,000
	.870	+ 87,000
	.756	+ 90,720
	.658	+ 26,320
	NPV =	24,040
	1.000	– 1,90,000
	.870	+ 87,000
	.756	+ 75,600
	.658	+ 32,900
	NPV =	5,500

On the basis of above Figure, it may be mentioned that the present situation is a two stage decision process. At stage 1, the firm has to decide whether to keep money in liquid form by depositing in a bank @ 12% or to buy a machine for the production of the new product. If the firm selects not to deposit the money in the bank, then to select, in the second stage whether to buy machine 1 or machine 2. It may be noted that if at stage 1, the firm decides to go for bank deposit, then evaluation of machine 1 and machine 2 is not required at all.

PROBLEM NO: 22

Assignment of Random Number.

Sales (Units)	Prob.	Cumulative Prob.	Random Number assigned.
2700	0.10	0.10	00 – 09
2800	0.15	0.25	10- 24
2900	0.20	0.45	25 – 44
3000	0.35	0.80	45 – 79
3100	0.15	0.95	80 – 94
3200	0.05	1.00	95 - 99

Statement Showing Profit/Loss position on Producing 3000 items and 2900 items per day.

Day	Random Number	Estimated Sales	Profit/Loss today when production = 3000 per day	Profit/Loss today when production = 3000 per day
1	11	2800	2800 × 1-200 ×1.50 = 2500	2800 × 1-100 ×1.50 = 2650
2	98	3200	3000 × 1-200 ×0.50 = 2900	2800 × 1-100 ×1.50 = 2650
3	66	3000	3000 × 1= 3000	2900 × 1- 100 ×0.50 = 2850
4	97	3200	3000 × 1-200 ×0.50 = 2900	2900 × 1- 300 ×0.50 = 2750

5	95	3200	3000 × 1-200 ×0.50 = 2900	2900 × 1- 300 ×0.50 = 2750
6	01	2700	2700 × 1-300 ×1.50 = 2250	2700 × 1- 200 ×1.50 = 2400
7	79	3000	3000 ×10 = 3000	2900 × 1- 100 ×0.50 = 2850
8	12	2800	2800 × 1-200 ×1.50 = 2500	2800 × 1- 100 ×1.50 = 2650
9	17	2800	2800 × 1-200 ×1.50 = 2500	2800 × 1- 100 ×1.50 = 2650
10	21	2800	2800 × 1-200 ×1.50 = 2500	2800 × 1- 100 ×1.50 = 2650
			26,950	26,950

The total profit for next 10 days will be Rs. 26,950, if company manufactures 3000 items per day. In case company decides to produce 2900 items per day profit shall remain unchanged.

THE END