Q.1

Step 1 :- Expected NPV

= PV of savings - PV of Recurring cost - I

= (12000 × 0.917 + 14000 × 0.842) -
(4000 × 0.917 + 5000 × 0.842) - 10000

= 22792 - 7878 - 10000

= 4914

Step 2 :- Sensitivity w.r.t. :-

① Plant Value :

$$MOS = \frac{4914}{10000} \times 100 = 49.14\%$$

② Running cost :

$$MOS = \frac{4914}{7878} \times 100 = 62.38\%$$

③ Savings :

$$MOS = \frac{4914}{22792} \times 100 = 21.$$

Savings is most sensitive to affect the viability of the project.

Q.2

i) **Initial Investment**

= PV of cash flows discounted @ IRR

= 57500 × PVAF (16%, 5)

= 57500 × 3.274

= 188255

② NPV of the project

MOS of kc = 60%.

If kc ↑ by 60%., NPV = 0

16% of kc = IRR

$$kc = \frac{IRR}{16\%} = \frac{16}{16\%} = 10\%.$$

NPV = 57500 × PVAF (10%., 5) - 188255

= 57500 × 3.791 - 188255

= 29727.5

③ Annual fixed cost

(Contribution - fixed cost) × 3.791 - 188255 = 0

If F ↑ by 7.8416%., NPV will ↓ by — ?

0.78416F × 3.791 = 29727.5

0.078416 F = 7841.59

F = 100000

④ Estimated annual unit of sale

P/V ratio = 70%., Fixed cost = 100000

Variable cost = ₹60 p.u.

∴ selling price = $\frac{60}{30\%}$ = ₹200

Cash Flow = Q (P - V) - F

57500 = Q (200 - 60) - 100000

157500 = 140 Q

∴ Q = 1125 unit

⑤ Break-even point = $\frac{\text{Fixed Cost}}{\text{Contribution p.u.}}$

= $\frac{100000}{140}$

= 714.29

Q.3

∴ Part 2 of sum :-

① Expected sale (Q) = ΣPx = 195000

↳ 175000 × 0.3 + 200000 × 0.6 + 225000 × 0.1

Selling Price	30.0
(-) Variable cost	16.5
Contribution p.u.	13.5
Quantity	195000
Contribution	2632500
(-) Fixed Cost	1000000
	1632500
n	5yrs
kc	12%
PVAF (12%, 5)	3.6048
PV of Cash Flows	5884836
(-) Initial Investment	5000000
Expected NPV	884836

acceptable level of risk = 20%.
Interpretation : Probability of '-ve' NPV should not exceed 20%.

Also, worst NPV in case of Poor Economy

= (175000 × 13.5 - 1000000) × 3.6048 - 5000000

= -88460 → probability = 30%.

Project is rejected since tolerance level is 20%.

② Sensitivity Analysis :-

We calculate MOS for each exogeneous variable.

a) Sales price -

$$MOS = \frac{884836}{195000 \times 30 \times 3.6048} \times 100 = 4.2\%$$

WRONG : solve part 1 1st

b) Sales Volume -

$$MOS = \frac{884836}{195000 \times 13.5 \times 3.6048} \times \; =$$

∴ Part 1 of sum :-

$NPV = (200000 \times 13.5 - 1000000) \times 3.6048 - 5000000$

$= 1128160$

Sensitivity Analysis w.r.t.

① selling price $= \frac{1128160}{200000 \times 30 \times 3.6048} \times 100 \cong 5.23\%$

② Sales Volume (Q)

$MOS = \frac{1128160}{200000 \times 13.5 \times 3.6048} \times 100 \cong 11.59\%$

③ Variable cost (V)

$MOS = \frac{1128160}{200000 \times 16.5 \times 3.6048} \times 100 \cong 9.48\%$

Scenario Analysis

Q.4

1) NPV under each scenario :

(₹ in millions)

Scenarios	Pessimistic	Expected	Optimistic
Sales	15	18	21
(-) Variable cost (%)	70%	2/3rd	65%
Contribution	4.5	6	7.35
(-) Fixed cost	1.3	1	0.8
(-) Depreciation	2	2	2
NOPAT (t = 1/3)	0.8	2	≅3
(+) Depreciation	2	2	2
CFAT	2.8	4	5
PVAF (12%, 10)	5.650	5.650	5.650
Investment	24	20	18
NPV	-8.18	2.6	10.25

2) Since the firm's risk profile does not permit acceptnc of projects where prob. of SHs wealth destruction is 25%. we should not accept since NPV of pessimistic scenario is negative.

3) Varying only on variable at a time -

(a) Investment → Pessimistic.

I = 24
S.P. = 18
V.C. = 2/3rd ∴ Contribution = 18 - 2/3rd of 18 = ₹6
F.C. = 1
Deprn = 2 ∴ NOPAT = (6-1-2) × 2/3 (t = 1/3)
= ₹2 millions
∴ CFAT = 2 + 2 = ₹4 millions

NPV = 4 × PVAF (12%, 10) - 24
= 4 × 5.650 - 24
= -1.4 millions

(b) Sales → Optimistic.

I = 20
S.P. = 21 ∴ Contribution = 21 - 2/3rd of 21 = 7
V.C. = 2/3rd
F.C. = 1 ∴ NOPAT = (7-1-2) × 2/3 (t = 1/3)
Deprn = 2 = 8/3
∴ CFAT = 8/3 + 2 = 14/3

NPV = 14/3 × 5.650 - 20
= 6.367

(c) Variable cost → Pessimistic

I = 20
S.P. = 18
V.C. = 70% ∴ Contribution = 18 - 70% of 18 = 5.4
F.C. = 1

Deprⁿ = 2 ∴ NOPAT = (5·4 − 1 − 2) × 2/3 (t = 3)

= 1·6

∴ CFAT = 1·6 + 2 = 3·6

NPV = 3·6 × 5·650 − 20

= 0·34 millions

(d) Fixed cost → Optimistic

I = 20

S·P. = 18

V·C. = 2/3rd ∴ Contribution = 18 − 2/3rd of 18 = ₹6

F·C. = 0·8

Deprⁿ = 2 ∴ NOPAT = (6 − 0·8 − 2) × 2/3 (t = 1/3)

= 2·13

∴ CFAT = 2·13 + 2 = 4·13

NPV = 4·13 × 5·650 − 20

= +3·35

Table :-

Key Variables	Range			NPV		
	Pessimistic	Expected	Optimistic	Pessimistic	Expected	Optimistic
Investment	24	20	18	−1·4	2·6	4·6
Sales	15	18	21	−1·17	2·6	6·367
Variable Cost	70	66·66	65	0·34	2·6	3·73
Fixed Cost	1·3	1	0·8	1·47	2·6	+3·35