Solution

① Optimist criterion

Max a_1 = Max(3, 5, 8, -1) = 8

Max a_2 = Max(6, 5, 2, 0) = 6

Max a_3 = Max(0, 5, 6, 4) = 6

Max (8, 6, 6) = 8

∴ a_1 is the best alternative

② pessimist criterion (Wald)

Min a_1 = min(3, 5, 8, -1) = -1

Min a_2 = Min(6, 5, 2, 0) = 0

Min a_3 = Min(0, 5, 6, 4) = 0

Max (-1, 0, 0) = 0

a_2 or a_3 is the best alternative

③ Laplace

Mean a_1 = (3 + 5 + 8 + 1)/4 = 3.75

Mean a_2 = (6 + 5 + 2 + 0)/4 = 3.25

Mean a_3 = (0 + 5 + 6 + 4)/4 = 3.75

Max(3.75, 3.25, 3.75) = 3.75

a_1 or a_3 is the best alternative

④ Hurwicz criterion

HV(a_1) = 0.4(8) + (1 - 0.4)(-1) = 2.6

HV(a_2) = 0.4(6) + 0.6(0) = 2.4

HV(a_3) = 0.4(6) + 0.6(0) = 2.4

Max(2.6, 2.4, 2.4) = 2.6

a_1 is the best alternative

⑤ Savage criterion

Alternatives	States of Nature			
	S_1	S_2	S_3	S_4
a_1	6-3=3	5-5=0	8-8=0	4-(-1)=5
a_2	6-6=0	5-5=0	8-2=6	4-0=4
a_3	6-0=6	5-5=0	8-6=2	4-4=0

$SV(a_1) = Max(3,0,0,5) = 5$

$SV(a_2) = Max(0,0,6,4) = 6$

$SV(a_3) = Max(6,0,2,0) = 6$

$Min(5,6,6) = 5$

a_1 is the best alternative.

⑥ Expected value of returns

	States of Nature			
	$P(S_1)=0.6$	$P(S_2)=0.1$	$P(S_3)=0.2$	$P(S_4)=0.1$
	S_1	S_2	S_3	S_4
a_1	3	5	8	-1
a_2	6	5	2	0
a_3	0	5	6	4

$E(a_1) = 0.6(3) + 5(0.1) + 8(0.2) - 1(0.1) = 3.8$
$E(a_2) = 6(0.6) + 5(0.1) + 2(0.2) + 0(0.1) = 4.5$
$E(a_3) = 0(0.6) + 5(0.1) + 6(0.2) + 4(0.1) = 2.1$

$Max(3.8, 4.5, 2.1) = 4.5$

a_2 is the best alternative.

⑦ Expected value criterion for opportunity less regret

we make the regret table

Alternatives	states of Nature			
	S_1	S_2	S_3	S_4
a_1	3	0	5	5
a_2	0	6	4	4
a_3	6	2	0	0

$p(S_1) = 0.6$
$p(S_2) = 0.1$
$p(S_3) = 0.2$
$p(S_4) = 0.1$

$EL(a_1) = 0.6(3) + 0(0.1) + 5(0.2) + 5(0.1) = 2.3$
$EL(a_2) = 0(0.6) + 6(0.1) + 4(0.2) + 4(0.1) = 1.6$
$EL(a_3) = 6(0.6) + 2(0.1) + 0(0.2) + 0(0.1) = 4$
$EL = Min(2.3, 1.6, 4) = 1.6$
a_2 is the best alternative

⑧ The criterion for states of nature is the frequent occurrence

$p^* = \max(0.6, 0.1, 0.2, 0.1) = 0.6 \Rightarrow S_1$

$ML(a_1) = 3,\ ML(a_2) = 6,\ ML(a_3) = 0$

$ML = \max(3, 6, 0) = 6$

a_2 is the best alternative.

Example: The following return Matrix is present cost matrix. Find the best alternative using

① opptimist
② pessimist
③ Laplace
④ Hurwicz $\alpha = 0.4$
⑤ Savage criterion
⑥ Expected Value Criterion for opportunity Loss EOL

$P(S_1) = 0.4,\ P(S_2) = 0.3$

$P(S_3) = 0.3$

strategies	States of Nature		
	Refreshing market	Good Market	stagnat Market
Investing in food trade	5	2	1
Investingin realestate	4	3	3
Investingin in stocks	2	6	1

① optimist criterion

Min a_1 = Min(5, 2, 1) = 1

Min (4, 3, 3) = 3

Min (2, 6, 1) = 1

Min(1, 3, 1) = 1

a_1 or a_3

② pessmist criterion

Max a_1 = Max(5, 2, 1) = 5

Max a_2 = Max(4, 3, 3) = 4

Max a_3 = Max(2, 6, 1) = 6

Min(5, 4, 6) = 4

a_2 is the best alternative

③ Laplace

Mean a_1 = (5 + 2 + 1)/3 = 8/3

Mean (4 + 3 + 3)/3 = 11/3

mean(a_3) = mean(2 + 6 + 1) = 9/3

Min(2.67, 3.33, 3) = 2.67

a_1 is the best alternative

④ Hurwicz $\alpha = 0.4$

$HV(a_1) = 0.4(1) + 0.6(5) = 3.4$

$HV(a_2) = 0.4(3) + 0.6(4) = 3.6$

$HV(a_3) = 0.4(1) + 0.6(6) = 4$

Min(3.4, 3.6, 4) = 3.4

a_1 is the best alternative

Savage criterion

	S_1	S_2	S_3
a_1	$5-2=3$	$2-2=0$	$1-1=0$
a_2	$4-2=2$	$3-2=1$	$3-1=2$
a_3	$2-2=0$	$6-2=4$	$1-1=0$

$SV(a_1) = Max(3, 0, 0) = 3$

$SV(a_2) = Max(2, 1, 2) = 2$

$SV(a_3) = Max(0, 4, 0) = 4$

$Min(3, 2, 4) = 2$

a_2 is the best

⑥ $EOL(a_1) = 3(0.4) + 0 + 0 = 1.2$

$EOL(a_2) = 2(0.4) + 1(0.3) + 1(0.3)$

$= 0.8 + 0.6 = 1.4$

$EOL(a_3) = 0 + 4(0.3) = 1.2$

$Min(1.2, 1.4, 1.2) = 1.2$

a_1 or a_3

⑦ Most likehood stat