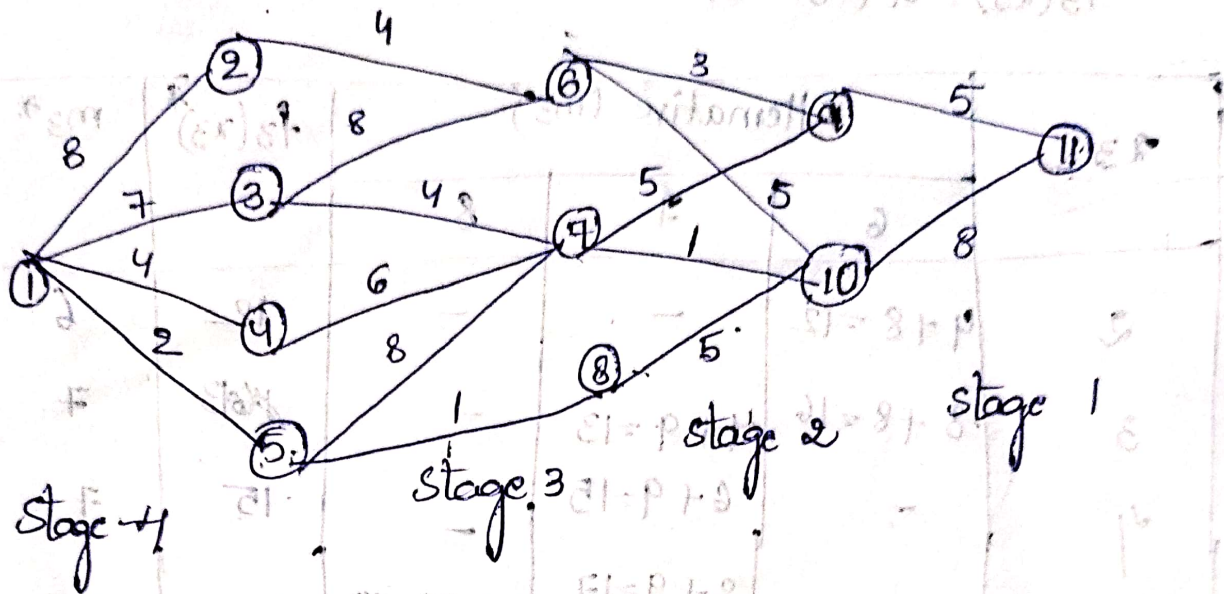


# Stage Coach / Shortest path



Sol:-

Stage - 1  $f_1(x_1) = d(x_1, m_1)$

$x_1$	Alternative $m_1$	$f_1(x_1)^*$	$m_1^*$
9	5	5	5
10	8	8	8

Stage 2  $f_2(x_2) = d(x_2, m_2) + f_1(x_1 = m_2)$

$x_2$	Alternative $m_2$		$f_2(x_2)^*$	$m_2^*$
	9	10		
6	3 + 5 = 8	5 + 8 = 13	8	9
7	5 + 5 = 10	11 + 8 = 19	10	10
8	-	5 + 8 = 13	13	10

Stage-3 :-

$$f_3(x_3) = d(x_3, m_3) + f(x_2 = m_3)$$

$x_3$	Alternative ( $m_3$ )			$f_3(x_3)^*$	$m_3^*$
	6	4	8		
2	$4+8=12$	—	—	12	6
3	$8+8=16$	$4+9=13$	—	<del>14</del> 15	7
4	—	$6+9=15$	—	15	7
5	—	$8+9=17$	$1+13=14$ $13=14$	<del>14</del> 14	8

Stage-4 :-

$$f_4(x_4) = d(x_4, m_4) + f(x_3 = m_4)$$

$x_4$	Alternative ( $m_4$ )				$f_4(x_4)^*$	$m_4^*$
	2	3	4	5		
1	$8+12=20$	$7+13=20$	$4+15=19$	$5+14=16$	16	5

$\Rightarrow 1-5-8-10-11 \Rightarrow$  shortest path

shortest Distance =  $2+1+5+8 = \underline{16}$



Stage-1 :-

No. of Salesman	0	1	2	3	4	5	6	7	8	9
Profit	30	45	60	70	79	90	98	105	100	100

Stage-2 :-

$x_1 \backslash x_2$	0	1	2	3	4	5	6	7	8	9
0	35	(65)	(80)	(95)	(105)	(114)	(125)	133	140	135
1	45	75	90	(105)	(115)	(124)	(135)	(143)	150	145
2	52	82	97	112	122	135	142	150	157	-
3	64	94	109	124	134	(143)	(154)	162	-	-
4	72	102	117	132	142	151	162	-	-	-
5	82	112	127	142	152	161	-	-	-	-
6	93	113	138	153	(163)	-	-	-	-	-
7	98	118	143	158	-	-	-	-	-	-
8	100	130	145	-	-	-	-	-	-	-
9	100	130	-	-	-	-	-	-	-	-

Stage-3 :-

No. of Salesman	0	1	2	3	4	5	6	7	8	9
	65	80	95	105	(115)	125	135	143	154	163
$f_1(x_1) + f_2(x_2)$	$0+0=0$	$0+1=1$	$0+2=2$	$0+3=3$ $1+2=3$	$1+3=4$ $2+2=4$	$0+5=5$ $1+4=5$	$1+5=6$ $3+4=7$	$1+6=7$ $3+4=7$	$3+5=8$ $4+4=8$	$6+3=9$ $5+4=9$

## Stage 4 :-

$n_3$	9	8	7	6	5	4	3	2	1	0
Profit ( $n_3$ )	110	110	110	102	95	82	70	60	54	42
$P_1(n_1) + P_2(n_2)$	$110+65=175$	$110+80=190$	$110+95=205$	$102+105=207$	$95+115=210$	$82+125=207$	$70+135=205$	$60+143=203$	$54+151=205$	$42+163=205$

$210 = 5$

Zone = 1  $\rightarrow$  1

Zone = 2  $\rightarrow$  3

Zone 3  $\rightarrow$  5

9 Salesman

Employee smoothening problem  $\rightarrow$  (S)

Ab. of Salesman ( $n_1$ )	Zone 1	Zone 2	Zone 3
0	30	35	42
1	45	45	54
2	60	52	60
3	70	64	70
4	79	72	82
5	90	82	95
6	98	93	102
7	105	98	110
8	100	100	110
9	90	100	110



# Capital Budgeting :-

Alternative	Plant - 1		Plant - 2		Plant - 3	
	Cost	Return	Cost	Return	Cost	Return
1	0	0	0	0	0	0
2	1	15	2	14	1	3
3	2	18	3	18	2	7
4	4	28	4	21	=	=

Maximum Capital Amount is 3 cr.

Stage

Stage - 1 :-  $f_1(x_1) = R(m_1)$

$x_1$	Alternative $m_1$					$f_1(x_1)$	$m_1^*$
	0	1	2	3	4		
0	0	0	15	18	28	0	1
1	0	15	18	28	28	15	2
2	0	15	18	28	28	18	3
3	0	15	18	28	28	18	3
4	0	15	18	28	28	28	4
5	0	15	18	28	28	28	4

Stage - 2

$x_2$	Alternative $m_2$					$f_2(x_2)$	$m_2^*$
	0	1	2	3	4		
0	0+0=0	0	14	18	21	0	1
1	0+15=15	15	18	28	28	15	2
2	0+18=18	14+0=14	18	28	28	18	2

	1	2	3	4	$f_2(x_2)$	$m_2^*$
3	$0+18=18$	$14+15=29$	$18+0=18$	—	29	2
4	$0+28=28$	$14+18=32$	$18+15=33$	$21+0=21$	33	3
5	$0+28=28$	$14+18=32$	$18+18=36$	$21+15=36$	36	3, 4

Stage-3

$x_3$	Alternative $m_3$				$f_3(x_3)$	$m_3^*$
	0	1	2	3		
0	$0+0=0$	—	—	—	0	1
1	$0+15=15$	$3+0=3$	—	—	15	1
2	$0+18=18$	$3+15=18$	$7+0=7$	—	18	1, 2
3	$0+29=29$	$3+18=21$	$7+15=22$	—	29	1
4	$0+33=33$	$3+29=32$	$7+18=25$	—	33	1
5	$0+36=36$	$3+33=36$	$7+29=36$	—	36	1, 2, 3

Stage-4 (Final)

Stage-3		Stage-2		Stage-1	
C	m	C	m	C	m
5	1	$5-0=5$	3	$5-3=2$	3
5	2	$5-1=4$	4	$5-4=1$	2
5	3	$5-2=3$	3	$4-3=1$	2
5	—	—	2	$3-2=1$	2

Alternatives  $\left\{ \begin{array}{l} P_1 \quad P_2 \quad P_3 \\ 3 \quad -3 \quad -1 \Rightarrow 2+3+0=5 \\ 2 \quad -4 \quad -1 \Rightarrow 1+4+0=5 \\ 2 \quad -3 \quad -2 \Rightarrow 1+3+1=5 \\ 2 \quad -2 \quad -3 \Rightarrow 1+2+2=5 \end{array} \right.$