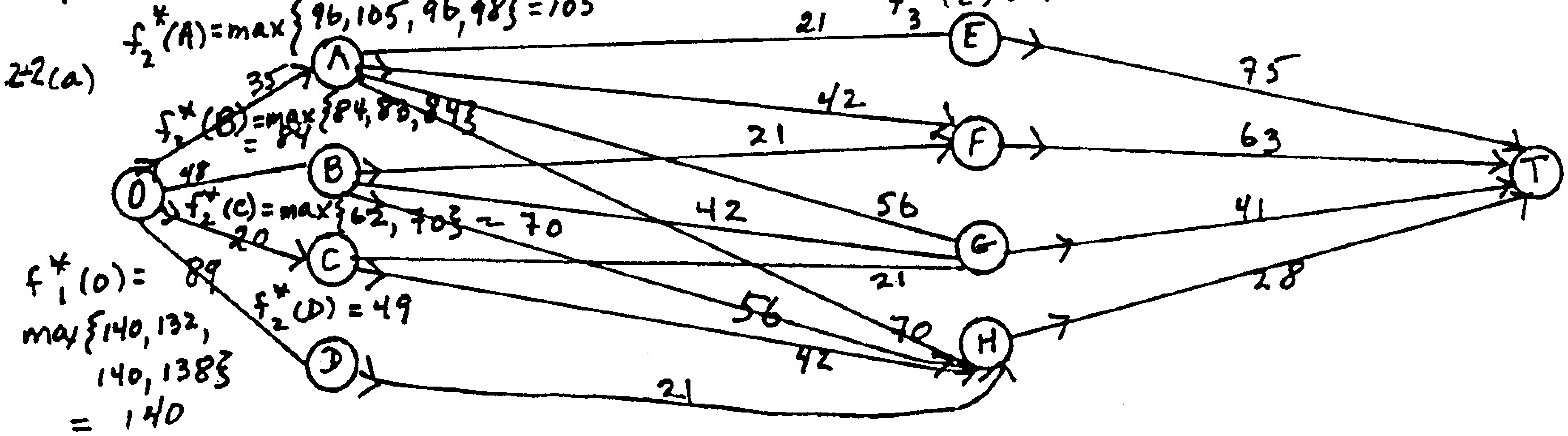
10.22(a)



Optimal routes: 0-A-F-T and 140 is the corresponding sales income.
0-C-H-T

Optimal Solution:

	Region 1	Region 2	Region 3
number of salespeople	3	2	1

(b) stage n — region n
state s_n — number of salespeople remaining to be allocated at stage n
x_n — number of salespeople allocated to region n
$c_n(x_n)$ — increase in sales in region n if x_n salespeople are allocated to it

INTERACTIVE DETERMINISTIC DYNAMIC PROGRAMMING ALGORITHM SOLUTION

Number of Stages = 3

Calculations:

S3	f3*(S3)	X3*
1	28	1
2	41	2
3	63	3
4	75	4

S2 \ X2	f2(S2, X2): 1	2	3	4	f2*(S2)	X2*
2	49	---	---	---	49	1
3	62	70	---	---	70	2
4	84	83	84	---	84	1,3
5	96	105	97	98	105	2

10.22(b) (Continued)

\ X1 \ S1\	f1(S1, X1) 1	2	3	4	f1*(S1)	X1*
6	140	132	140	138	140	1,3

Optimal solution(s):

Optimal solution	X1*	X2*	X3*
1	1	2	3
2	3	2	1

10.3-2

Let x_n be the number of study days allocated to course n.

Let $p_n(x_n)$ be the number of grade points expected when x_n days are spent on course n.

Let s_n be the number of study days not yet allocated.

Then, $f_n^*(s_n) = \max\limits_{1 \le x_n \le \min(s_n,4)} [p_n(x_n) + f_{n+1}^*(s_n - x_n)]$

Number of Stages - 4

Calculations:

S4	f4*(S4)	X4*
1	6	1
2	7	2
3	9	3
4	9	4

S3 \ X3	f3(S3, X3): 1	2	3	4	f3*(S3)	X3*
2	8	---	---	---	8	1
3	9	10	---	---	10	2
4	11	11	13	---	13	3
5	11	13	14	14	14	3,4

10.3-2 (CONTINUED)

S2 \ X2	f2(S2, X2) 1	2	3	4	f2*(S2)	X2*
3	13	---	---	---	13	1
4	15	13	---	---	15	1
5	18	15	14	---	18	1
6	19	18	16	17	19	1

S1 \ X1	f1(S1, X1) 1	2	3	4	f1*(S1)	X1*
7	22	23	21	20	23	2

Optimal solution(s):

Optimal solution	X1*	X2*	X3*	X4*
1	2	1	3	1

10.3-3 Let x_n = number of commercials run in area n.

10.4-2

(a) Let x_n be the investment made in year n; that is, $x_n = 0, A, B$.
Let s_n be the amount of money on hand at the begining of the year.
Let $f_n(s_n, x_n)$ be the maximum expected amount of money at the end of the third year given s_n and x_n in year n.

For $s_n \geq 5000$
$$f_n(s_n, x_n) = \begin{cases} f^*_{n+1}(s_n) & x_n = 0 \\ .3 f^*_{n+1}(s_n - 5000) + .7 f^*_{n+1}(s_n + 5000) & x_n = A \\ .9 f^*_{n+1}(s_n) + .1 f^*_{n+1}(s_n + 5000) & x_n = B \end{cases}$$

For $0 \leq s_n < 5000$ $\quad f_n(s_n, x_n) = f^*_{n+1}(s_n)$ and $x_n = 0$
(one cannot invest less than 5000)

$n=3$:

s_3	$f^*_3(s_3)$	x^*_3
$0 \leq s_3 < 5000$	s_3	0
$s_3 \geq 5000$	$s_3 + 2000$	A

$n=2$:

s_2 \ x_2	$f_2(s_2, x_2)$: 0	A	B	$f^*_2(s_2)$	x^*_2
$0 \leq s_2 < 5000$	s_2	—	—	s_2	0
$5000 \leq s_2 < 10000$	$s_2 + 2000$	$s_2 + 3400$	$s_2 + 2500$	$s_2 + 3400$	A
$10000 \leq s_2$	$s_2 + 2000$	$s_2 + 4000$	$s_2 + 2500$	$s_2 + 4000$	A

10.4-2 cont.

$n=1$:

s_1 \ x_1	$f_1(s_1,x_1)$: 0	A	B	$f_1^*(s_1)$	x_1^*
5000	8400	9800	8150	9800	A

The optimal policy is to always invest in A with an expected fortune after three years of \$9800.

(b) Let x_n and s_n be as in part (a).
Let $f_n(s_n, x_n)$ be the maximum probability of having at least \$10,000 after 3 years given s_n and x_n.

$n=3$:

s_3 \ x_3	$f_3(s_3,x_3)$: 0	A	B	$f_3^*(s_3)$	x_3^*
$0 \le s_3 < 5000$	0	—	—	0	0
$5000 \le s_3 < 10000$	0	.7	.1	.7	A
$10000 \le s_3 < 15000$	1	.7	1	1	0 or B
$15000 \le s_3$	1	1	1	1	0, A or B

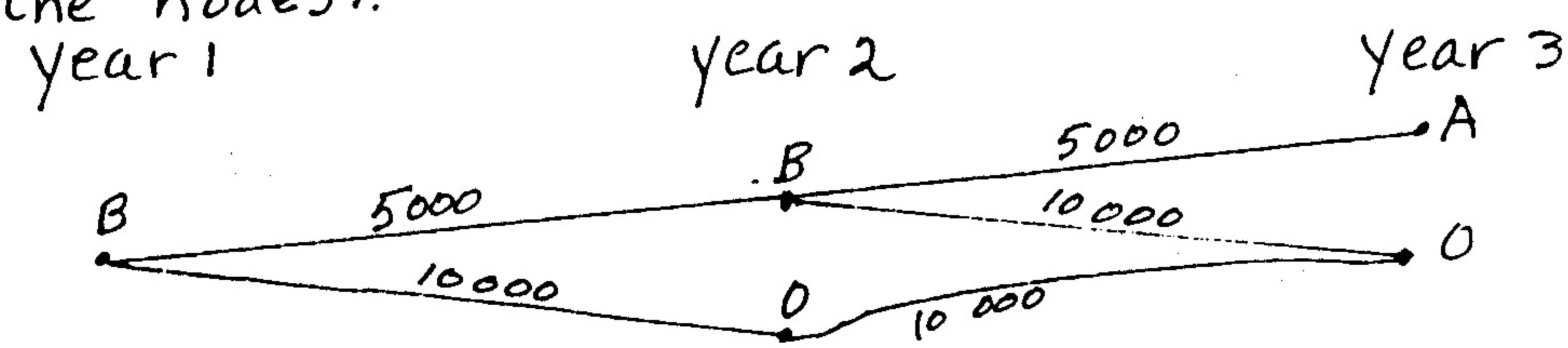
$n=2$:

s_2 \ x_2	$f_2(s_2,x_2)$: 0	A	B	$f_2^*(s_2)$	x_2^*
$0 \le s_2 < 5000$	0	—	—	0	0
$5000 \le s_2 < 10000$	.7	.7	.73	.73	B
$10000 \le s_2$	1	.73	1	1	0 or B

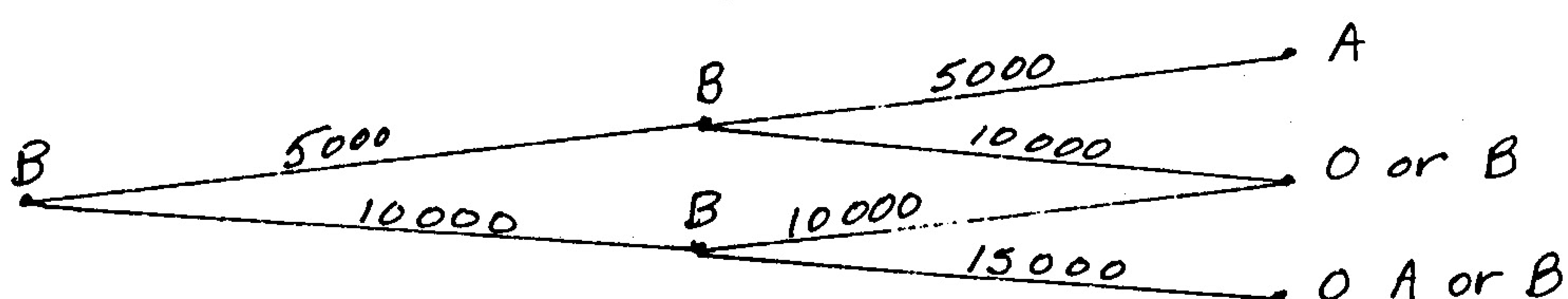
$n=1$:

s_1 \ x_1	$f_1(s_1,x_1)$: 0	A	B	$f_1^*(s_1)$	x_1^*
5000	.73	.7	.757	.757	B

Hence, the optimal policies are (using the numbers on the arcs to represent the return on the investment indicated at the nodes).



or



and the maximum probability of having at least \$10,000 at the end of three years is .757.