Assg-2&3

Q1

Notn $\hat{V}^{(T)}_{(S)}$: Value fn estimate for state S from Trajectory T

i) First Visit Method

S_1:- $\hat{V}^{(1)}(s_1) = r_4 + r_5 + r_6$

$= 0 + 3 + 7 = 10$

$\hat{V}^{(2)}(s_1) = 2 + 5 = 7$.

$\hat{V}^{(3)}(s_1) =$ Not possible

$\hat{V}^{(4)}(s_1) = 1 + 0 + 2 + 2 = 5$

$\hat{V}^{(5)}(s_1) = -1 + -2 + 2 + 6 + 3 = 8$

$\therefore V_\pi(s_1) = \frac{10+7+5+8}{4} = \frac{30}{4} = \boxed{7.5}$

S_2: $\hat{V}^{(1)}(s_2) = -1 + 2 + 5 + 0 + 3 + 7 = 16$

$\hat{V}^{(2)}(s_2) = -3 + 2 + 5 = 4$.

$\hat{V}^{(3)}(s_2) =$ Not possible

$\hat{V}^{(4)}(s_2) = 0 + 2 + 2 = 4$

$\hat{V}^{(5)}(s_2) = -2 + 2 + 6 + 3 = 9$

$V_\pi(s_2) = \frac{33}{4} = \boxed{8.25}$

S_3: $\hat{V}^{(1)}(s_3) = 2 + 5 + 0 + 3 + 7 = 17$

$\hat{V}^{(2)}(s_3) =$ Not possible

$\hat{V}^{(3)}(s_3) = 2 + 1 + 4 = 7$

$\hat{V}^{(4)}(s_3) = 2 + 2 = 4$

$\hat{V}^{(5)}(s_3) = 6 + 3 = 9$

$V_\pi(s_3) = \frac{37}{4} = \boxed{9.25}$.

S_4: $\hat{V}^{(1)}(s_4) = 7$

$\hat{V}^{(2)}(s_4) = 8 + (-3) + 2 + 5 = 7$

$\hat{V}^{(3)}(s_4) = 4$

$\hat{V}^{(4)}(s_4) = 2$

$\hat{V}^{(5)}(s_4) = 6 + -1 + -2 + 2 + 6 + 3 = 14$

$V_\pi(s_4) = \frac{34}{4} = \boxed{8.5}$

(ii) Every visit method. Notn $\hat{V}_i^{(j)}(s)$: subtrajectory i of trajectory j (i.e. beginning at i) → value fn estimate of states

$\hat{V}_1^{(1)}(s_1) = 0+3+7 = 10$

$\hat{V}_2^{(1)}(s_1)$

State	Value fn name :	Calc	no. of Subtrajectory (no. of visits)	Subtotal
s_1	$\hat{V}_1^{(1)}(s_1)$	$0+3+7 = 10$	1	20
	$\hat{V}_2^{(1)}(s_1)$	$3+7 = 10$	2	
	$\hat{V}_1^{(2)}(s_1)$	$2+5 = 7$	1	7
	$\hat{V}_1^{(3)}(s_1)$	—	1	5
	$\hat{V}_1^{(4)}(s_1)$	$1+0+2 = 5$	1	8
	$\hat{V}_1^{(5)}(s_1)$	$-1-2+2+6+3$		
	$V(s_1)$	Total $(20+7+5+8)/4 = 40$	5	$40/5 = 8$
s_2	$\hat{V}_1^{(1)}(s_2)$	$-1+2+5+0+3+7 = 16$	1	31
	$\hat{V}_2^{(1)}(s_2)$	$5+0+3+7 = 15$	2	
	$\hat{V}_1^{(2)}(s_2)$	$-3+2+5 = 4$	1	4
	$\hat{V}_1^{(3)}(s_2)$	⟶		
	$\hat{V}_1^{(4)}(s_2)$	$0+2+2 = 4$	1	4
	$\hat{V}_1^{(5)}(s_2)$	$-2+2+6+3 = 9$	2	20
	$\hat{V}_1^{(5)}(s_2)$	$2+6+3 = 11$		
	$V(s_2)$	Total $20+4+4+31 = 59$	6	9.83
s_3	$\hat{V}_1^{(1)}(s_3)$	$2+5+0+3+7 = 17$	1	17
	$\hat{V}_1^{(2)}(s_3)$	—	0	
	$\hat{V}_1^{(3)}(s_3)$	$2+1+4 = 7$	2	12
	$\hat{V}_2^{(3)}(s_3)$	$4+1 = 5$		
	$\hat{V}_1^{(4)}(s_3)$	$2+2 = 4$	1	4
	$\hat{V}_1^{(5)}(s_3)$	$6+3 = 9$	1	9
	$V(s_3)$	42 (Total)	5	8.4

S_4	$\hat{V}_1^{(1)}(S_4)$	$7 = 7$	1	7
	$\hat{V}_1^{(2)}(S_4)$	$3 + (-3) + 2 + 5 = 7$	2	} 12
	$\hat{V}_2^{(2)}(S_4)$	$5 = 5$		
	$\hat{V}_1^{(3)}(S_4)$	$4 = 4$	1	} 4
	$\hat{V}_1^{(4)}(S_4)$	$2 = 2$	1	2
	$V_1^{(5)}(S_4)$	$6 + -1 + -2 + 2 + 6 + 8 = 19$	2	} 17
	$V_2^{(5)}(S_4)$	$3 = 3$		
	$V(S_4)$	$18 + 2 + 4 + 12 + 7 = 42$	7	$42/7 = 6$