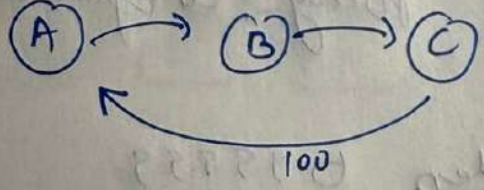
Homework :- 6

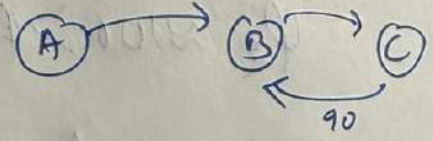
GXS230001

Q1

1.)



Policy 1



Policy 2

2.) discount = $0.0000001 = 10^{-7}$

$$V^{\pi}(s_t) = \sum_{i=0}^{\infty} \gamma^i r_{t+i} + \dots = r_t + \gamma V^{\pi}(s_{t+1})$$

$C \rightarrow A$ 100

$B \rightarrow A$

$A \rightarrow B$

$B \rightarrow A$

$C \rightarrow A$

so policy 2 will satisfy

2.1) $V^{\pi}_S = r(s, \pi(s)) + \gamma(V^{\pi}(\delta(s, \pi(s))))$

$$\sum_{K=0}^{\infty} \gamma^{KT} R = \frac{R}{1-\gamma^T}$$

Policy 1 $\quad \frac{90}{1-\gamma^2} \approx 90$

Policy 2 :-

$$\frac{100}{1-\gamma^3} = 100$$

$\phi_2 \approx 100 > \phi_1 \approx 90$ Policy 2 is optimal

3 optimal policy when 0.999.99

$$T = 2 \quad \beta = 90$$

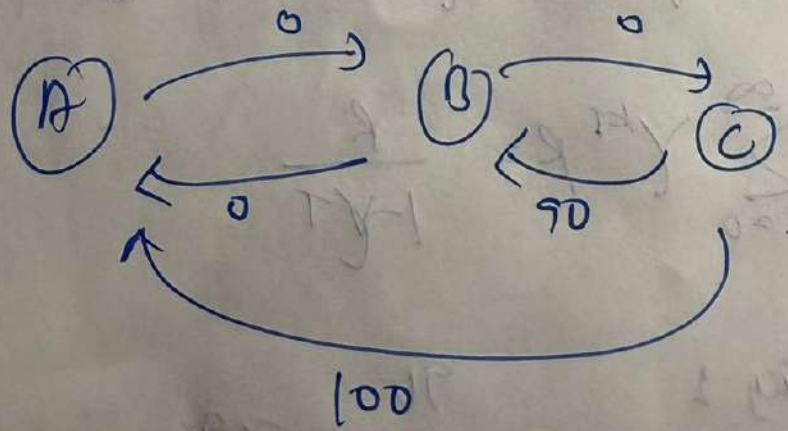
$$\frac{90}{1-\gamma^2} = \frac{90}{1-(1-10^{-7})2} \approx 30 / 2 \cdot 10^{-7}$$

$$= 4.5 \times 10^{-8}$$

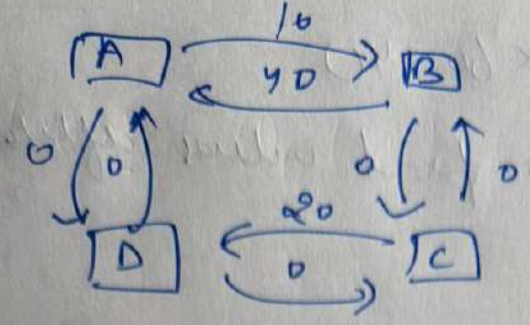
Policy 2 $\frac{100}{3 \times 10^{-7}} = 3.33 \times 10^{8}$

Policy 1 is optimal

4

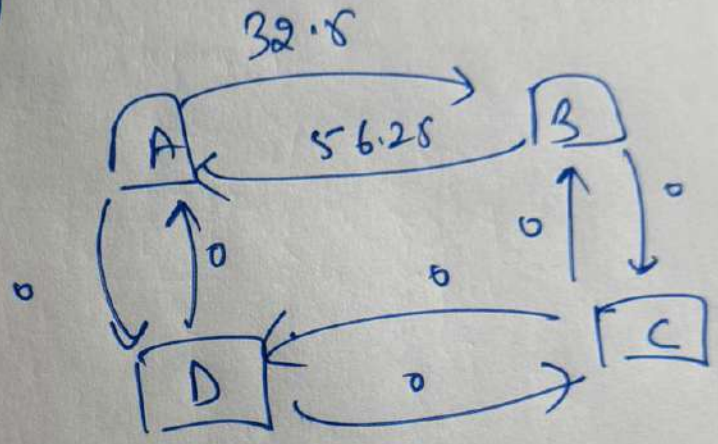


Q2



$$\phi(s,a) \leftarrow r + \gamma \max_{a'} \hat{\phi}(s',a')$$

find



Part B

A → B 10

B → A 40

$\gamma = 0.5$

$\alpha = 1$

$\phi(B) = 40 + 0.5 \times (10 + 0.5\,\phi(B)) = 40 + 5 + 0.25\,\phi(B) = 45 + 0.25\,\phi(B)$

$\phi(B) = 60$

$Q(A) = 10 + 0.5 \times 60 = 40$

The algo settles on fixed values after some fluctuating.

Q3

1	0,0
2	4,0
3	5,1
4	6,0

$k = 2$

$m = 4$

Part 1

1.) Initial Cluster

3 and 4

3. 4,0 5,1

$\sqrt{(4-0)^2+(0-0)^2}$ $\sqrt{(4-4)^2+(0-0)^2}$ $\sqrt{(5-4)^2+(1-0)^2}$ $\sqrt{(6-4)^2+(0-0)^2}$

$\sqrt{(6-0)^2+(0-0)^2}$ $\sqrt{(6-4)^2+(0-0)^2}$ $\sqrt{(6-5)^2+(0-1)^2}$ $\sqrt{(6-5)^2+(0-1)^2}$

$\sqrt{(5-0)^2+(1-0)^2}$ $\sqrt{(5-4)^2+(1-0)^2}$ $\sqrt{(5-5)^2+(1-0)^2}$ $\sqrt{(6-5)^2+(1-0)^2}$

36	2	2	0	(6,0)
26	1	0	2	(5,1)

C_1 C_2

1,2,3 4

Q2

$\left(\frac{0+4+5}{3}, \frac{1}{3}\right)$ (6,0)

(3, 1/3) (6,0)

C1 = 1,2 C2 = 3,4

3 (2,10) (5.5, 0.5)

Cluster 1 = (0,0) Cluster 2 = (4,0) (5,1) (6,0)

4 (0,0) (5, √3)

Cluster 1 = 1 Cluster 2: 2,3,4

5 Same as 4

6 Same as 4

Question 4

1	1, 1
2	1,2
3	1,0
4	4,1
5	4,2
6	4,0

Part 1 1.) Point 3 and 5

Cluster 1	Cluster 2
1,2,3	4,5,6

2 Point 4 and 6

4 (4,1) 6 (4,0)

$(4-1)^2+(1-1)^2 = 9$
$(4-1)^2+(2-1)^2 = 10$
$(4-1)^2+(2-0)^2 = 10$
$(4-4)^2+(1-1)^2 = 0$
$(4-4)^2+(2-1)^2 = 1$
$(4-4)^2+(1-0)^2 = 1$

$(4-1)^2+(1-0)^2 = 10$
$(4-1)^2+(2-0)^2 = 13$
$(4-1)^2+(0-0)^2 = 9$
$(4-4)^2+(1-0)^2 = 1$
$(4-4)^2+(2-0)^2 = 4$
$(4-4)^2+(6-0)^2 = 0$

Cluster 1

(1, 2, 4, 5)

Cluster 2

(3, 6)

Part 2 1.)

1	$d = 0$
2	$d = 1$
3	$d = 1$
4	$d = 9$
5	$d = 10$
6	$d = 10$

Point 1

$(1-1)^2+(1-1)^2 = 0$
$(1-1)^2+(2-1)^2 = 1$
$(1-1)^2+(1-0)^2 = 1$
$(4-1)^2+(1-1)^2 = 9$
$(4-1)^2+(2-1)^2 = 10$
$(4-1)^2+(1-0)^2 = 10$

2 $0+1+1+9+10+10 = 31$

1	$P = 0/31$
2	$P = 1/31$
3	$P = 1/31$
4	$P = 9/31$
5	$P = 10/31$
6	$P = 10/31$

3 Cluster 1 1, 2, 3.

Cluster 2 = 4, 5, 6

4 Nothing will change because the probability 9/31

5 Nothing will change because of the probability 1/31

6 one of the three points with the largest probability

$9/31 = 0.935$