Q1: D

Q2: B

Q3: H

Q4: D

Q5: A

Q6: E

Q7: A

Q8: B

Q9: C

Q10: C

Q11: 11.28

Q12: 6

Q13: From deontological perspective, people have their rights to use whatever they bought, no matter the how well the performance of autonomous vehicles are. Driving cars is an experience that can brings happiness to our human beings and cannot be replaced by any AI machines, so we should protect them not being banned.

Q15: 5.29

Q16:

i) Yes. For each reachable goal, h(s) < ∞.

ii) No. For node 1, it has h(s) > h\*(s), which is 5 > 2.

iii) No. For node 1 transits to node 2, h(1) > c(a) + h(2), which is 5 > 1 + 3.

iv) No. The goal state has h(Goal) = 2.

v) No. For node 1, h(1) = 5, while h\*(1) = 2.

Q17:

i) node 6, node 8, node 9, node 10.

ii) node 8, node 10.

iii) Both of the algorithms can find the goal state.

Q18:

F = {robot(x, y), box(x, y), target(x, y), iswall(x, y) | for x, y in {0, 1, 2, … n}}

O = {move(dx, dy):

Prec: at(x, y);

Add: at(x+dx, y+dy);

Del: at(x, y)

| dx, dy in {-1, 0, 1} and |dx| + |dy| = 1 and not box(x+dx, y+dy) and not iswall(x+dx, y+dy)

swap(x, y, x’, y’):

Prec: robot(x, y), box(x’, y’);

Add: robot(x’, y’), box(x, y);

Del: robot(x, y), box(x’, y’)}

I = {robot(a, b), box(c, d), target(d, e)}

G = {box(d, e)}

Q19:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| on(1) | on(2) | near(1, 1) | near(1, 2) | near(2, 1) | near(2, 2) | done(1) | done(2) |
| 0 | ∞ | ∞ | 0 | 0 | ∞ | ∞ | ∞ |
| 0 | 1 | ∞ | 0 | 0 | ∞ | ∞ | ∞ |
| ∞ | ∞ | ∞ | 0 | 0 | ∞ | 2 | 2 |
| 1 | 1 | ∞ | 0 | 0 | ∞ | 2 | 2 |
| 1 | 1 | ∞ | 0 | 0 | ∞ | 2 | 2 |

hmax= 2

bs(done(1)) = q(2, 1), needs to support prec: on(2).

bs(done(2)) = q(1, 2), all precs supported by initial state.

bs(on(2)) = r(1, 2), all precs supported by initial state.

hff= 3.

Q20:

Gt = r(Base, get\_kit1, No kit) + γ \* r(No kit, get\_kit2, Kit2) + γ2 \* max\_a(Q(Kit2, a))

= 0 + 0.9 \* 0 + 0.92 \* 6

= 4.86

Q(Base, get\_kit1) = Q(Base, get\_kit1) + α[Gt - Q(Base, get\_kit1)]

= 0 + 0.5\*(4.86 - 0)

= 2.43

Q21:

|  |  |  |
| --- | --- | --- |
| Me  Market | Buy | Sell |
| Buy | 4, 0 | 2, 5 |
| Sell | 2, 1 | 3, -1 |

If the market and me needs to decide simultaneously, we can apply mixed strategy.

For me, suppose the probability of market taking Buy action being p, taking Sell action being 1 – p. To make the payoff of buy and sell of my choice indifferent to the choice of market, we have the equation:

0 + 1 – p = 5p – (1 - p)

p = 2/7

Thus, the probability of market buying is 2/7 and selling 5/7.

For market, suppose the probability of me taking Buy action being p, taking Sell action being 1 – p. To make the payoff of buy and sell of market choice indifferent to the my choice, we have the equation:

4p + 2 \* (1 – p) = 2p + 3 \* (1 - p)

p = 1/3

Thus, the probability of me buying is 1/3 and selling 2/3.

If the action is taken sequentially, we can model this problem as an extensive normal form game.

* Me moves first:

(2, 5) vs (2, 1), so market can either buy or sell.

* Market moves first:

(4, 0) vs (3, -1), so I will choose buy.