HW4

1.

Truth Table	A	B	C	D	Sentence (a)	Sentence (b)
Untitled	T	T	T	T	T	T
Untitled	T	T	T	F	T	T
Untitled	T	T	F	T	T	T
Untitled	T	T	F	F	T	T
Untitled	T	F	T	T	T	T
Untitled	T	F	T	F	T	T
Untitled	T	F	F	T	F	T
Untitled	T	F	F	F	F	T
Untitled	F	T	T	T	T	T
Untitled	F	T	T	F	T	T
Untitled	F	T	F	T	T	T
Untitled	F	T	F	F	T	T
Untitled	F	F	T	T	T	T
Untitled	F	F	T	F	T	T
Untitled	F	F	F	T	F	T
Untitled	F	F	F	F	F	F

a. **12**

b. **15**

c. **0**

- As the first conjunct is $False$, the next conjuncts builds on that model which results in zero models

---

2.

- The robot needs to be aware of the following:
  - Traffic Signal, Road Crossing Signal
  - The number and the positions of people standing to cross the road
  - Width of the road and the crossing lane
  - Vehicles in proximity (if they are about to cross the lane or have crossed the lane)
  - It can also be built to detect specific road conditions such as rough terrain, slippage, unpaved and rugged roads and detecting of objects (if any)

- Goal: The robot primary objective is to detect pedestrians, traffic signals and guide the pedestrians to cross the road safely without obstructing traffic.
- The robot needs to model
  - Average time taken by a human to cross the road and the duration of the signal
  - Vehicles speed at the entry or exit with the duration of the signal

i. $A \wedge B$

ii. $A \implies B$

iii. $Study \leftrightarrow Score$

iv. $D \wedge R \Rightarrow (U \vee H) \wedge \neg RH$

where, D → Dry, R → Raining, U → Umbrella, H → Hoodie, RH → Raining Heavily

v. $\neg(\neg(L \vee I) \implies P)$

where L → Late, I → Incomplete, P → Losing Points

4.

The sentence becomes,

$A \vee (A \wedge B) \leftrightarrow \neg(A \wedge B \wedge C)$

$A \leftrightarrow \neg(A \wedge B \wedge C)$

- **A is True if and only if A and B and C is not True**

5.

1. $\exists x Student(x) \wedge Pass(x, English) \wedge Fail(x, Maths)$
2. $\forall\ x\ Student(x) \wedge Class(x, Registered) \wedge University(x, Enrolled)$
3. $\exists x\ \exists y\ Uncle(x, y) \vee Aunt(x, y) \leftrightarrow Niece(y, x) \vee Nephew(y, x)$
4. $\forall\ x\ Old(x) \wedge Strong(x) \implies \neg(Wither(x))$

Programming Assignments

1. Forward Planning

i. Which algorithm or algorithms would be most appropriate for planning in a very restricted domain (i.e., one that has only a few actions) and needs to operate in real time?

Solution: Greedy best-first search with unmet goals heuristic and Uniform-cost search

ii. Which algorithm or algorithms would be most appropriate for planning in very large domains (e.g., planning delivery routes for all UPS drivers in the U.S. on a given day)?

Solution: A-star search with unmet goals heuristic and breadth-first search

iii. Which algorithm or algorithms would be most appropriate for planning problems where it is important to find only optimal plans?

Solution: Breadth-first search, uniform-cost search, and A-star search with unmet goals heuristic make a plan with an optimal number of steps.

Extra: Outputs

1. Map Color

```
(hw2) shreyasprasad@Shreyass-MBP ~ % /Users/shreyasprasad/opt/anaconda3/envs/hw2/bin/python /Users/shreyasprasad/Downloads/map_color.py
Enter number of  colors? 1
Invalid Input
Enter number of  colors? 2
Invalid Input
Enter number of  colors? 3
{'ab': 1, 'mb': 1, 'nb': 1, 'nl': 1, 'yt': 1, 'bc': 2, 'ns': 2, 'nu': 2, 'on': 2, 'sk': 2, 'nt': 3, 'pe': 3, 'qc': 3}
```

2. Forward Planning

https://gist.github.com/prasadshreyas/db388aa891aecd05bf157be192821921