

M. d. shah p. 12
6+2 (calculator)

Sai Parthig . M
1002022847

Assignment - 3

Task - 1

(18) Given, the knowledge base (KB) and query (SI)

$\neg A \vee B \wedge C \vdash KB \quad SI$

True True True True True

True True False False True

True False (True) True True

True False False False True

False True True False False

False True False False False

False False True True True

False False False False False

Part a:-

The above information provided KB entails SI. Whenever knowledge Base is true then SI should be true. If this condition can satisfies when $KB \neq SI$. In the above table we can see the Row 1, 3, 7 are the rows where KB is true and SI is true. Therefore KB entails SI.

Part-B

& Summary

According to the above information
 $\neg T(KB)$ does not entail $\neg T(S1)$.
Because in the above provided
information $\neg T(KB)$ is true in
at least one case where $\neg T(KB) \neq$
 $\neg T(S1)$, $\neg T(KB)$ should be true
when ever $\neg T(S1)$ is true. So,
 $\neg T(KB)$ does not entail $\neg T(S1)$.

Task 2

given the knowledge base contain various propositional-logic sentences that utilize symbol A, B, C, D and there are only two cases when the knowledge given:-

first case: when A is true, B is false

C is true, D is false. Second case:-

when A is false and B is false

C is true, D is true, where there are two cases below knowledge base.

A B C D
True False True False .

A B C D
False False True True .

All other known cases KB is true, and for the CNF we consider cases and base is false, for which

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

for the above task we use DeMorgan's law, CNF as follows :-

$$(\neg A \vee B \vee \neg C \vee D) \wedge \\ (A \vee \neg B \vee \neg C \vee \neg D).$$

Sai Parthib M
1002022847

Task: 3

Specialized backward

Consider the KB

$(A \Rightarrow C) \text{ AND } (B \Rightarrow C) \text{ AND } (D \Rightarrow A)$

$\text{AND } G \text{ AND } [(B \text{ AND } E) \Rightarrow G] \text{ AND }$

$(B \Rightarrow F) \text{ AND } D,$

While we take as the given question
we split them

$A \Rightarrow C, B \Rightarrow C, B \Rightarrow \text{and } C \Rightarrow B$

$D \Rightarrow A, E, (B \wedge F) \Rightarrow B \Rightarrow F, D.$

① forward chaining

for the forward chaining

$(A \Rightarrow C) \text{ AND } (B \Rightarrow C) \text{ AND } (D \Rightarrow A)$

$\text{AND } G \text{ AND } [(B \text{ AND } E) \Rightarrow G] \text{ AND }$
 $(B \Rightarrow F) \text{ AND } D.$

$\boxed{D \Rightarrow A, D}$ added to KB

$\boxed{A \Rightarrow C, A}$ added to KB

$\boxed{C \Rightarrow B, C}$ added to KB

$\boxed{(B \wedge E) \Rightarrow G, B, E}$ added to KB

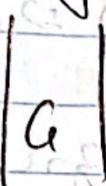
\boxed{G}

$\boxed{\text{KB } FG}$ (knowledge base
entails G)

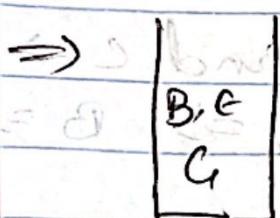
midst of life
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ii) Backward Chaining:-

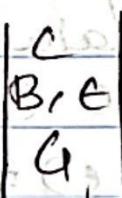
we push G to the stack first



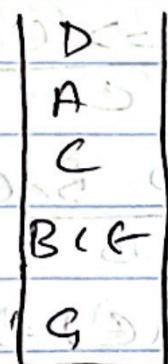
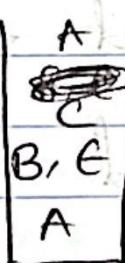
then added B, E to the



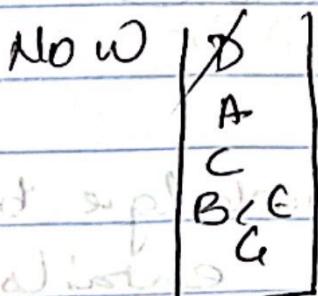
⇒ push C to the Stack.



⇒ push A to the Stack.



push D to the Stack



D is in knowledge base.

Modell für log.
→ P8 (ex 10a)

$$\frac{A, A \Rightarrow C}{C}$$

C
B \cap C
G

↳ möglich (d)

Then

$$\frac{\frac{C_1 B \Rightarrow C \wedge C \Rightarrow B}{B}}{B}$$

C is in KB

E
G

main (d)

$$\frac{B, E : B \cap E \Rightarrow G}{G}$$

G

on (A \cap B) \cap

∴ knowledge base entails G

iii Resolution:

$$(A \vee B) \cap (A \vee C) \cap (B \vee C) \cap (B \vee D)$$

given equivalence

$$(A \Rightarrow C) \cap (B \Rightarrow C) \cap (D \Rightarrow A)$$
$$\wedge E \wedge [(B \cap E) \Rightarrow G]$$

$$(A \vee D) \cap (A \vee C) \cap (B \Rightarrow F) \wedge D$$

P → A ∨ B ∨ C ∨ D ∨ E ∨ F

→ B ∨ C ∨ D ∨ E.

$$(A \Rightarrow C) \cap ((B \Rightarrow C) \cap (C \Rightarrow B) \cap (D \Rightarrow A)) \cap$$
$$\cap [(B \cap E) \Rightarrow G] \cap (B \Rightarrow F) \wedge D$$

b) Replace \Rightarrow

$$(\neg A \vee C) \wedge ((\neg B \vee C) \wedge (\neg C \vee B)) \\ \wedge (\neg D \vee A) \wedge E \wedge [\neg (\neg B \wedge \neg E) \vee G] \\ \wedge (\neg \neg B \vee F) \wedge D$$

c) move \neg

$$(\neg A \vee C) \wedge [(\neg B \vee C) \wedge (\neg C \vee B)] \wedge \\ (\neg D \vee A) \wedge E \wedge \neg (\neg B \wedge \neg E \vee G) \\ \wedge (\neg B \vee F) \wedge D$$

d) Now by applying De Morgan's law

$$(\neg A \vee C) \wedge (\neg B \vee C) \wedge (\neg C \vee B) \wedge (\neg D \vee A) \\ \wedge E \wedge (\neg \neg B \wedge \neg E \vee G) \wedge (\neg B \vee F) \wedge D$$

Now add \neg at G $\neg (\neg G)$

$$\neg D \wedge (\neg E \wedge \neg G) \wedge \neg A$$

$$(\neg A \vee C) \wedge (\neg B \vee C) \wedge (\neg C \vee B) \wedge (\neg D \vee A) \\ (\neg B \wedge \neg E \vee G) \wedge (\neg B \vee F) \wedge D \rightarrow G$$

$\therefore K B \vdash G$

$$\neg (\neg a \wedge \neg b) \wedge (\neg c \wedge \neg d) \wedge (\neg e \wedge \neg f) \wedge (\neg g \wedge \neg h) \\ \neg (\neg a \wedge \neg b) \wedge \{ \neg (\neg c \wedge \neg d) \wedge \neg (\neg e \wedge \neg f) \} \wedge \neg (\neg g \wedge \neg h)$$

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Sri Parthish M
1002022847

Task-4

John and Mary sign the following contract. If it rains on Monday, then John must give Mary a check for \$ 500 on Tuesday, and if a rain on Tuesday, Mary must mow the lawn on Wednesday.

Part-a:

The first logic statement to express the contract are

Rains(x) :. rains on x day

gives(x, y) :. x gives \$ 100 to y
mow(x) :. x mows lawn

Contract :-

for the contract of the above

statement

$\neg \text{Rains}(\text{Monday}) \Rightarrow \text{gives } 100(\text{John}, \text{Mary})$

$\text{Cives } 100(\text{John}, \text{Mary}) \Rightarrow \text{mow}(\text{Mary})$

Part b:- The logical Statement
what truly happened is when
use possible, use the same predicates
and constants. is
 $\neg \text{TR}(\text{monday})$ - no rain on monday
Gives 100 (John, mary) where the
John gives \$100 check to mary
on Tuesday,
 $\text{mow}(\text{mary})$ - The mary needs to
mowed the lawn on wednesday,
So, the logic statement to
Express what truly happened is
 $\neg \text{Rains}(\text{monday}) \wedge \text{gives}(\text{John}, \text{mary})$
 $\wedge \text{mow}(\text{mary})$

Part C :- was ent 20

The symbols required to
convert (any KB) involved in the
above domain from FOL to Propo-
sitional logic.

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Sai Parikh. M
1002022547.

S1 : Remy : Raids (many)

S2 : RJ : Raid (John)

S3 : RMD : Raids (monday)

S4 : GJ : Gives 100 (John, John)

S5 : GJ : gives 100 (John, John, Mary)

S6 : GJ MD : gives 100 (John, Monday)

S7 : GJ J : gives (Mary, John)

S8 : GJ M M : gives 100 (Mary, Mary)

S9 : GJ M D : gives 100 (Monday, Monday)

S10 : GJ D J : gives 100 (Monday, John)

S11 : GM B M Y : gives 100 (Monday, Mary)

S12 : GM Y M D : gives 100 (Mary, Monday)

S13 : M J : mow (John)

S14 : M M D : mow (Monday)

S15 : M M Y : mow (Mary).

So, as the above information,

$$S_3 \Rightarrow S_5,$$

$$S_5 \Rightarrow S_{14}$$

Truly Happened Events are

~ RMD ~ GJ MY
~ M M Y

M. A. Nitrogen
(PPS-2020)

Sai Parthish, M
1002022547

Part d:-

Was the contract violated or not, the answer to say is NO. We cannot find a scenario where the event and true and contracts are false. Because there is no scenario where event entails contract and the contract is not violated. When the contract is true in all events and based on the result the contract is not broken.

YMT IN MARCH
YMTA

Task: 5

i) Taller(x, John); Taller(Bob, y)
So for the given unifiers, exists θ for
Substitution $\theta = \{x/Bob, y/John\}$.

ii) Taller(y, mother(x)); Taller(
Bob, Mother(Bob))
 $\theta = \{x/Bob, y/Mother(Bob)\}$

iii) Taller(Sam, Mary), Shorter(x, Sam)
For

a we'll return true for Sam to
than Mary
Shorter b) we'll return true if returns
for x is Shorter than Sam
(d) Working. $\theta \models x/Mary \ y$

iv) Shorter(x, Bob); Shorter(y, z)
no binder as $\{x/y, x/Bob\}$

v) Shorter(Bob, John); sort(x, mary)
For this, unifier doesn't exist

Task 6:-

\Rightarrow 2 Adults (A₁, and A₂) and 2 children (C₁ and C₂) left side of the river.

A₁ \rightarrow Adult 1, A₂ \rightarrow Adult 2, and
C₁ \rightarrow Child 1 and C₂ \rightarrow Child 2
C₃ \rightarrow Children 3.

B \rightarrow Boat and left, right.

Predicates:-

is child (x) \equiv x is child

is Boat (x) \equiv x is Boat

on (x, y) \equiv x is on y

Initial state:-

Where we initial state

On (A₁, left) \ominus on on (A₂, left) \ominus

On (C₁, left) \ominus on (C₂, left) \ominus on

Boat (B, left) \ominus child (C₁) \ominus

In child (C₂) \ominus his Boat (B)

Actions:-

Actions to be considered are

\rightarrow move - (- left - to right) (n, y)

Precond: not (A₁) \ominus not

is Boat (y) \ominus on (y, left)
not (y, left)

Effect: on (x, right) \ominus not (y, right) \ominus

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Sai Parthish M
1002022847

(Left, x) non (y, Right) n on (y, Right) n
on (x, left) n on (y, left) n

move 1 - Right - to - left (n, y)

Pre cond.:-

is Boat (y) n on (n, left) n

on (n, right) n on (y, left) n

Effect:- (y, Right) n on (y, Right) n on .
(n, left) n on (y, left)

→ move-2 - Left - to - Right (n, y, z)

Pre cond.:- (y, Right) n on (n, left) n

is Boat (z) n is child (y) n on

(n, left) n on (y, left) n on (z, left)

Effect:- (y, Right) n on (n, Right) n on

on (z, Right) n on (n, left) n on (y, left)

(z, Right) n on (n, Right) n on (y, Right) n on (z, Right)

→ move-2 - Right - to - Left (n, y, z)

Pre cond.:-

is Boat (z) n is child (y) n

on (n, Right) n on (y, Right) n on (z, Right)

Effect :-

on (x, left) n on (y, left) n on (z, left)
n non (x, right) n non (y, Right)
n non (z, Right)

Goal Test :-

on (A, Right) n on (A₂, left) n on
(A₃, left) n on (C, Right) n on
(C₂, Right) n on (C₃, Right)

A complete Plan looks like

move - 2 - left - to - Right (A, C, B)

move - 1 - Right - to - left (C, B),

move - 2 - Left - to - Right (A₂, C, B),

move - 1 - Right - to - left (C₂, B)

move - 2 - left to - Right (A₃, C₃, B).

move - 1 - Right - to - left (C₃, B)

move - 2 - left - to - Right (A₁, C₂, B),

move - 1 - Right - to - left (C₁, B)

move - 2 - left - to - Right (A₁, C₃, B),

Task :- Ape at right - 1 - move

The problem for the previous task the modified actions that previously described to account for this if you were going to try and handle this Scenario by

i) Execution monitoring / online Replanning
There will no change in actions for execution monitoring that are used in previous task. If there a plan can be generated if and only if any a new plan can is place of old one

ii) Conditional Planning:-

Move - i - left to Right (n,y)
Precondition :-

is Box (y) n on (x, left) n only, left effect :- =)

Lon (n,Right) n on (y,Right) n on
(n,Left) n on (y,Left)
v [on (n,Left) n on (y,Left)]

move - 1 - Right to left (n,y)

Pre-condition:-

is_Boat(y) \cap on(x,right)

on(x,right) \cap not on(x,right)

Effect

[on(n, left) \cap on(y, left) \cap on
(n, right) \cap only(y, right)]

\cup [on(n, right) \cap on(y, right)]

Task: 8

Suppose that they are using PDDL to describe facts and actions in a certain world called JUNGLE world. There are 5 constants, given that there are 3 predicates. Then there are 1 to 4 arguments. And 15 constants are there so the possible arguments can be $3 \times 5^1 - 3 \times 5^4 = 15 - 1875$ where the possible states $= (2^{15} - 1)^5$ from right.

4 arguments (P, Q, R, S) and 5 constants (A, B, C, D, E)

4 arguments (P, Q, R, S) and 5 constants (A, B, C, D, E)

(AP(A))P \wedge (AP(A) \wedge BP(B))P

(AP(A))P \wedge (AP(A) \wedge BP(B))P

And each response (A, B, C, D, E)

And each behavior as

(AP(A))P \wedge BP(B)P

(AP(A))P \wedge CP(C)P