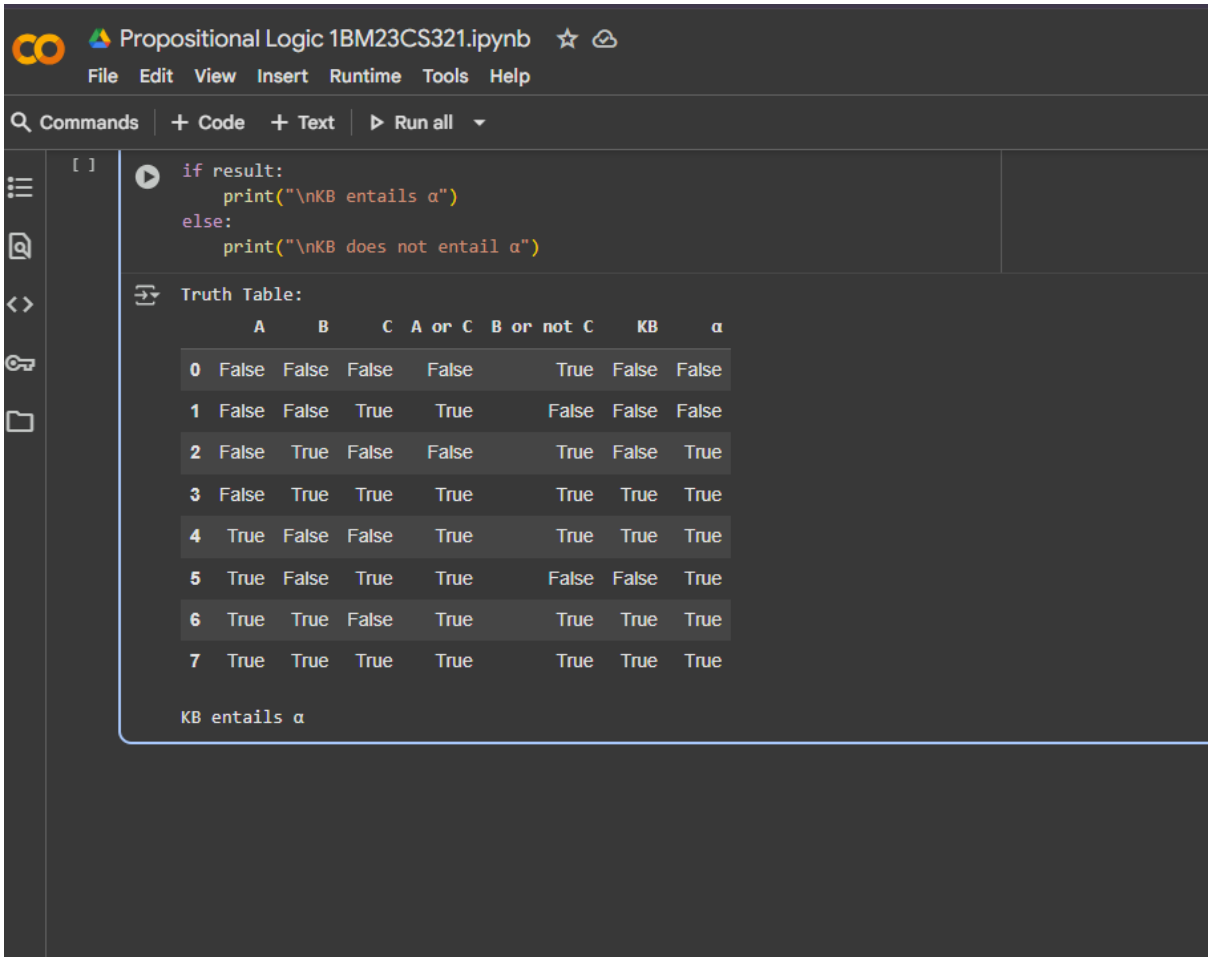
```python
import pandas as pd
from itertools import product
import re

def tokenize(sentence):
    # Tokenize based on logical operators, parentheses, and symbols
    # Tokens are: '(', ')', 'and', 'or', 'not', variables (letters),
whitespace ignored
    token_pattern = r'\w+|[()]'
    return re.findall(token_pattern, sentence)

def pl_true(sentence, model):
    # Tokenize the sentence
    tokens = tokenize(sentence)

    # Logical operators in Python are lowercase
    logical_ops = {'and', 'or', 'not'}

    evaluated_tokens = []
    for token in tokens:
        token_lower = token.lower()
        if token_lower in logical_ops:
            # Keep operators as is (lowercase)
            evaluated_tokens.append(token_lower)
        elif token in model:
            # Replace symbol with 'True' or 'False' string
            evaluated_tokens.append(str(model[token]))
        else:
            # Parentheses or unknown tokens are kept as is
            evaluated_tokens.append(token)

    # Join tokens with spaces for safe eval
    eval_sentence = ' '.join(evaluated_tokens)

    try:
        return eval(eval_sentence)
    except Exception as e:
        print(f"Error evaluating sentence: {eval_sentence}")
        raise e

def tt_entails(kb, alpha, symbols):
    truth_table = []

    for model in product([False, True], repeat=len(symbols)):
        model_dict = dict(zip(symbols, model))

        kb_value = pl_true(kb, model_dict)
        alpha_value = pl_true(alpha, model_dict)
```

```
        row = {
            'A': model_dict.get('A', False),
            'B': model_dict.get('B', False),
            'C': model_dict.get('C', False),
            'A or C': model_dict.get('A', False) or model_dict.get('C',
False),
            'B or not C': model_dict.get('B', False) or not
model_dict.get('C', False),
            'KB': kb_value,
            'α': alpha_value
        }
        truth_table.append(row)

        if kb_value and not alpha_value:
            return False, pd.DataFrame(truth_table)

    return True, pd.DataFrame(truth_table)

def get_symbols(kb, alpha):
    # Find unique uppercase letters as symbols
    return sorted(set(re.findall(r'[A-Z]', kb + alpha)))

# Example usage:

kb = "(A or C) and (B or not C)"
alpha = "A or B"

symbols = get_symbols(kb, alpha)

result, truth_table = tt_entails(kb, alpha, symbols)

print("Truth Table:")
display(truth_table)

if result:
    print("\nKB entails α")
else:
    print("\nKB does not entail α")
```


Propositional Logic 1BM23CS321.ipynb
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[ ]
if result:
print("\nKB entails α")
else:
print("\nKB does not entail α")
Truth Table:
A B C A or C B or not C KB α
0 False False False False True False False
1 False False True True False False False
2 False True False False True False True
3 False True True True True True True
4 True False False True True True True
5 True False True True False False True
6 True True False True True True True
7 True True True True True True True
KB entails α

LAB - VI

Propositional Logic.

Truth table for connectives.

P	Q	$\neg P$	$P \wedge Q$	$P \vee Q$	$P \Leftrightarrow Q$
False	False	True	False	false	true
False	True	True	false	true	false
True	False	false	false	true	false
True	True	false	true	true	true

Propositional Inference : Enumeration Method ⇒

$\alpha = A \vee B$. $KB = (A \vee C) \wedge (B \vee \neg C)$.

A	B	C	$A \vee C$	$B \vee \neg C$	KB	α
False	False	False	False	True	False	False
False	False	True	True	false	false	false
False	True	False	False	True	false	True
False	True	True	True	True	True	True
True	False	False	True	True	True	True
True	False	True	True	false	False	True
True	True	False	True	True	True	True
True	True	True	True	True	True	True

Algorithm ⇒

1) Start with TT- Entails (KB, α):
   Check if the knowledge base (KB) entails the query (α) by calling TT- CHECK ALL.

2) In TT- CHECK- ALL (KB, symbols, model):
   If no symbols left, check if KB is true.
   If KB is true, and α is false, return false.
   If symbols remain, pick the first symbol and recursively check both possible assignments.

3) Repeat the process for all truth assignments.

4) Final Result:
   Return TRUE if KB always makes α true, otherwise, return False if there's any case where KB is true and α is false.

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