Week 6

PropositionalLogic TruthTableEnumeration

Code:

```
#Create a knowledge base using propositional logic and show that the given
query entails the knowledge base or not.
import itertools
# Function to evaluate an expression
def evaluate expression(a, b, c, expression):
   # Use eval() to evaluate the logical expression
  return eval(expression)
# Function to generate the truth table and evaluate a logical expression
def truth table and evaluation(kb, query):
   # All possible combinations of truth values for a, b, and c
  truth values = [True, False]
   combinations = list(itertools.product(truth values, repeat=3))
   # Reverse the combinations to start from the bottom (False -> True)
  combinations.reverse()
   # Header for the full truth table
  print(f"{'a':<5} {'c':<5} {'KB':<20}{'Query':<20}")</pre>
   # Evaluate the expressions for each combination
   for combination in combinations:
       a, b, c = combination
       # Evaluate the knowledge base (KB) and query expressions
       kb result = evaluate expression(a, b, c, kb)
       query result = evaluate expression(a, b, c, query)
       # Replace True/False with string "True"/"False"
       kb result str = "True" if kb result else "False"
       query_result_str = "True" if query_result else "False"
       # Convert boolean values of a, b, c to "True"/"False"
       a str = "True" if a else "False"
```

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b_str = "True" if b else "False"
       c str = "True" if c else "False"
       # Print the results for the knowledge base and the query
       print(f"{a_str:<5} {b_str:<5} {c_str:<5} {kb_result_str:<20}</pre>
{query result str:<20}")
   # Additional output for combinations where both KB and query are true
  print("\nCombinations where both KB and Query are True:")
  print(f"{'a':<5} {'b':<5} {'c':<5} {'KB':<20}{'Query':<20}")</pre>
   # Print only the rows where both KB and Query are True
   for combination in combinations:
       a, b, c = combination
       # Evaluate the knowledge base (KB) and query expressions
       kb result = evaluate expression(a, b, c, kb)
       query result = evaluate expression(a, b, c, query)
       # If both KB and query are True, print the combination
       if kb result and query result:
           a_str = "True" if a else "False"
           b str = "True" if b else "False"
           c str = "True" if c else "False"
           kb result str = "True" if kb result else "False"
           query result str = "True" if query result else "False"
           print(f"{a str:<5} {b str:<5} {c str:<5} {kb result str:<20}</pre>
{query result str:<20}")
# Define the logical expressions as strings
kb = "(a or c) and (b or not c)" # Knowledge Base
query = "a or b" # Query to evaluate
# Generate the truth table and evaluate the knowledge base and query
truth_table_and_evaluation(kb, query)
```

Output:

False	False		Query False
False	True	False	False
True	False	False	True
True	True	True	True
False	False	True	True
False	True	False	True
True	False	True	True
True	True	True	True
	False False True True False False True	False False False True True False True False False True True False	b c KB False False False True False True False True False False True False True False True False True True False True True True True

Combinations where both KB and Query are True: a b c KB Query False True True True True False False True True True True False True True True True True True True True True True

Observation:

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12/1		PRIMITS.
	Emplementation of Ineth-table encemeration	on algorithm for
- 1	deciding propositional enlightment.	AL AMERICA
	Algorithm: repeate signed at adol to	
- Promise	step-1: alifine symbols and expressions	
	(i) Define propositional symbols (AIBIC)	col - 1
ar vo	(ii) define components of the knowled	ge base a 146
	query (x)	
	206	
	Step 2: Generale the Ineth table	
213	(i) use iterbooks, products to generat	a all theth
	assignments for AIBIC WIN	
	(ii) evaluate and print the values	OL AIBIC. AVC
	BV-c, KB and querylx) for	each.
1 92 6	Step 3: Check alignment	11121
T	(i) for each theth assignment, ch	eckil KB imblis
r r	the queries. Cif tB is true, ther	query (x) must
7 3	also be true)	
7 4	A Company of the A	decement land
O.K.	Step 4: print enlightnment result	Mupro
	(i) print wheather the KB entails+	he query or not
	based on the enlightment check.	
	output:	+-9-11-12
	A B C AVC BY	-c KB «(AVB)
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-		e True true
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	EB entails the query (x)	

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19/11/24	Set saci
and the	PREPOSITION LOGIC!
	i ability and he is lary or.
1.	Either John is not shipid and he is logy or he is shipid. John is shipid therefore john is not lasy
	3= 3hipid . John 15 stapes
	L= lazy
	either john is not empid and he is lary or he
sat Ja	
	is shipid.
	stant atout sat storsally stople
All	premise 1 = either john is not shipid and he is
	lasy or the is shipind and
SVA	premise 2: John is shipid to structure (1)
	conclusion: John is not lasy.
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	F F F F F F F F F F F F F F F F F F F
	argument is invalid because both fremix ax
tan vo.	true conclusion is false today trad is
	buds the enlighterest that
2.	if P then 0 elve R
	Algorithm: A SVA
False	
eure f	(ii) identify sentince components (subjet, predicate,
west !	quantify sentince winporters competit, prediction,
True	Gir) convert to pol was
WAL S	(iv) universal, existential, qualification, conjuntion,
WI S	implication, negation and sure
2007	(v) construct for expression
	(iii) Petern FOL expression.
	PE entrain the query (4)

2.	4 P then Q else D
	HP then Q else R D→Q Y→P→P Date Date
	Date
agend.	P A R P A P P P P if Pthenachr
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	human (Table)
COACH C KIND SERVED BUILDING STREET	
	Jaman 12 mortel
(Cu.	Loves (John, man)
4.	there is someone who loves many
d	all dogs are animals
5.	
U	tal dog(1) - animals(1)
y 6.	- augs an 1000150
t-dd an	Faldog(s) A brown(s))
4274 14	Truck is no person who is both a harhola and
01 101	marnea 21 and dayset the stores what
	= 18 Ja(bachelor(a) 1 married(1))
8.	many is the mother of john
X 10 Trisk	mother (many john) of (4,2)2 (6,2)9 com
4109.	John and many both are shiderts
1	shident (John) a shident (many)
10.	If it is raining, then the ground is wet
211	raining > wet (ground)
	a similar of the sound of

1. There is a person who knows every other Fary (Person (a) A personly) na +y -> knows (2,y) 12. Nobody is taller than themselves tx -> taller (212) 13. all shederts in the class passed the exam + 2 (shedent (1) 1 inclass (2) -> passed (1)) 14. many has a but dog 7 2 (dog (1) ~ petof (many, 2)) 15. if alice is a teacher, then alice teacher math teacher (alia) - teaches (alia, math) everyone loves someone ((y, r) sevas) y Es + 17. no one is both teacher and a student # ? - (tacher (a) 1 shidert(1)) 18. every man respects his parents + a (man(i) -> > y (parent (y, 2) n respects (rey)) 19. not all sheder's like both math and science ~ + x (shedent (2) -> (like (, math) 1 likes (x, science)) 2. Transition of formal stalements to english 1. 2. (H(1) y. - M(1,y)) U(1) where H(1) = man = 2 ((1) = a is unhappy and and hig = range over put There exists a person who is not married to anyone and is unhappy 2. P(2,2) s(2,y) w(y) when P(3,2)= 3 is parent of 2 dod (3,4) = 3 is sublinoly while a (an bly) - y Lwonn There exists a person who is parent of exis a sibling of y and y is women.