AI Assignment

411922

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Q2) Propositional logic statements:

① Mythical → ¬Mortal

② ¬Mythical → Mortal ∧ Mammal

③ ¬mortal ∨ Mammal → Horned

④ Horned → Magical

we will infer

⑤ ¬Mythical ∨ ¬Mortal — ①

6a Mythical ∨ Mortal — ②

6b Mythical ∨ Mammal — ②

⑦ ¬Mortal ∨ Mammal — ⑤ & 6b

⑧ Horned — ③ & ⑦

⑨ Magical — ④ & 8

⑩ Mythical — Modus pones or any other rule doesn't satify the condition

" Hence the unicorn is both Magical & Horned"

Q3) (i) True

because false has no models & entails every sentence AND because True is true for all models & Hence is entitled by every Sentense.

(ii) ~~True~~ False

(iii) True

because on L.H.S all the terms are considered as one model and which is also present in the 2 models on R.H.S

(iv) false

because one of the models of A⇔B has both A & B & this doesnot satisfy the condition

(v) True

Because A⇔B is on R.H.S which states one of the conjuncts in the def of A⇔B

(vi) ~~A∧B~~ True

R.H.S is false because both the disjucts are false i.e A, B are true & C is false. so L.H.S is false

(vii) True

(viii) True; Because remaining a conjuct only allows more models

(ix) false, because remaining a conjuct only allows more models

(x) True, because it B satisfible

(xi) True, because R.H.S is entitles by L.H.S so models are those of A⇔B

(xii) True, Because 1/2 of models satisfy (A⇔B)⇔C & there are same no.of models & non models

Q4) (a) True

if alpha is valid it is true in all models

hence α must be valid

(b) false

α trivially holds in every model of false

(c) True

(d) True

(e) False

Q5) (a) True & it follows monotonicity

(b) True if $(\beta \wedge \gamma)$ is true in every model of α

then β & γ are true in every model of α

so $\alpha \models \beta$ & $\alpha \models \gamma$

(c) If $\alpha \models (\beta \vee \gamma)$ then $\alpha \models \beta$ or $\alpha \models \gamma$

false, consider $\beta = A$, $\gamma = \neg A$

Q6) (a) false, only if B & C are false, which

occurs in 4 cases for A & D

(b) false, only if A, B, C & D are false

occurs only in 1 case.

(c) the last four conjuncts specify a model in

which the 1st conjuct is false.

Q7) a) valid

b) Neither

c) Neither

d) valid

e) valid

f) valid

g) valid

Q8) CNF representations :-

S1 : $(\neg A \vee B \vee E) \wedge (\neg B \vee A) \wedge (\neg E \vee A)$

S2 : $(\neg E \vee D)$ S3 : $(\neg C \vee \neg F \vee \neg B)$

S4 : $(\neg E \vee B)$ S5 : $(\neg B \vee F)$

S6 : $(\neg B \vee C)$

Q9) (a) (i) NO, this sentence Asserts, among other things, that all conservations are radical, which is not what was stated.

(ii) yes, this says that if a person is a radical then they are electable iff they are conservative

(iii) NO, this is equivalent to $\neg R \vee \neg C \vee E \vee \neg E$ which is a tautology, true under any Assignment

(b)(i) $\equiv ((R \wedge E) \Rightarrow C) \wedge (C \Rightarrow (R \wedge E))$

$\equiv ((R \wedge E) \Rightarrow C) \wedge (C \Rightarrow R) \wedge (C \Rightarrow E)$

(ii) $\equiv R \Rightarrow ((E \Rightarrow C) \wedge (C \Rightarrow E))$

$\equiv \neg R \vee ((\neg E \vee C) \wedge (\neg C \vee E))$

$\equiv (\neg R \vee \neg E \vee C) \wedge (\neg R \vee \neg C \vee E)$

(iii) True $\Leftarrow\Rightarrow$ True

$$R \Rightarrow ((C \Rightarrow E) \vee \neg E)$$

Q10) (a)

Goal is neglected $(G)/(\neg G)$ with last 2 Classes to produce $\neg C$ & $\neg D$ with $\neg C$ & $\neg D$ we can reduce $\neg A$ & $\neg B$ with all clauses we are able to produce an empty clause.

(b) First each 2-CNF Clause has 2 phases to put literals. There are $2n$ distinct literals. So there are $(2n)^2$ syntactically distinct clauses & they are identical.

$C(2n,2) = (2n)(2n-1)/2 = 2n^2 - n$ Clauses with 2 diff literals. & all these clauses are semantically distinct except those are equivalent to true so we get $2n^2 - 2n + 1$ clauses with different literals & there are $2n$ clauses with repeated literals. all distinct. So there are $2n^2 + 1$ distinct clauses in all.

(c) Resolving 2-CNF clauses can't increase the clause size therefore resolution can generate only $O(n^2)$ distinct clauses before it terminates

(d) The no. of 3-CNF clauses is $O(n^3)$. so there wont be non polynomial complexity on the basis of the no of diff clause by resolving two 3-CNF clauses can increase the clause size to 4 & so on. so clause size grows to $O(n)$ giving $O(n^2)$ possible clause.

Q1) from the given fig shows that "There is no pit in [2,2]", "There is a wumpus in [1,3]".

if there is a pit in [2,2], then there has to be breeze in [1,2] but it is not there. So there is no pit in [2,2].

1,4	2,4	3,4	4,4
1,3	2,3	3,3	4,3
1,2 $\boxed{A}$ S ok	2,2 ok	3,2	4,2
4,1 ✓ ok	2,1 ✓ ok B	3,1	4,1

As there is strench in [1,2] there has to be a wumpus in [1,3] or [2,2]. But if there is wampus in [2,2] then there has to be stench in [2,1], but it is not there.

So, there is wumpus in [1,3].

So, proved both of them.