# MIT SCHOOL OF ENGINEERING

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Name of the Experiment:

Performed on:

Submitted on:

| Marks | Teacher's Signature with date |
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| 10 | |

Q1. What do you mean by entailment of knowledge base?

Ans. Entailment of knowledge base means that a sentence follow is from the premises contained in the knowledge base.

$$KB \models \alpha$$

Knowledge Base KB intails sentence $\alpha$ if & only if $\alpha$ is true in all models where KB is true.

Eg. does $x=0$ intail $x^2 + y = 0$?
or $\alpha$ be true where KB is false?

- $KB \models \alpha$ ... if $F(KB \Rightarrow \alpha)$ is valid (true in all model)
- $KB \models \alpha$ iff $(KB \wedge \neg \alpha)$ is unsatisfiable (true is no model)

Basically entailment refers to how premise lead to a conclusion.

Incomplete for Theory ☐ Diagrams ☐ Observation Table ☐
Calculations ☐ Graphs ☐ Results ☐ Conclusion ☐
Understanding Through Q/A ☐ Late Submission ☐ Neatness ☐

Teacher's Signature

Q2 What is Clausal form? How do you convert a proposition into a clausal form.

Ans.

Clausal form is a subset of that order logic. It is a normal form in which sentences is defined by a universal.

- Prefix is a matrix
  Clause is a expression of the form $L_1 \ldots L$ where lead $L_1$ is a literal.

Any KB can be converted into a sequential CNF.

K-CNF, exactly k literal for clausal.
Eg:- $B_{11} \Leftrightarrow [P_{12} \Leftrightarrow P_{22}]$

1) Eliminate $\Leftrightarrow$ replacing $\alpha \Leftrightarrow \beta$.
$(\alpha \Rightarrow \beta) \wedge (\beta \Rightarrow \alpha)$
$B_{11} \Rightarrow (P_{12} \vee P_{11}) \wedge (P_{12} \vee P_{22} \Rightarrow \neg B_{12})$

2) Eliminate $\Rightarrow$ replacing $\alpha \Rightarrow \beta$ with $\neg \alpha \vee \beta$
$\Rightarrow (\neg B_{12} \vee (P_{12} \vee P_{22})) \wedge (\neg (P_{12} \vee P_{21}) \vee B_{21})$

3) Apply distributive law ($\wedge$ over $\vee$) & pattern.

$\Rightarrow (\neg B_{12} \vee P_{12} \vee P_{21}) \wedge (\neg P_{12} \vee B_{12}) \wedge (\neg P_{21} \vee B_{11})$

Q3. Give murder Case.
First write Symbol to Information.

S: The knife is in the store room
C: We saw the knife when we cleaned the store room.
b: The murder was committed at the basement.
a: Murder was committed at the basement.
y: The knife is in the yellow dustbin.
D = The murder was committed outside the bridding.
y = we are exable to find the knife.

(i) Write propositional statement for each.

$s \rightarrow c$

$b \vee a$

$b \rightarrow y$.

$\neg c$

$o \rightarrow u$.

$a \rightarrow s$.

(ii). a) $s \rightarrow c$.

$\neg s \vee c$

b) $b \vee a$

c) $b \rightarrow u \Rightarrow -b \vee c$

d) $\neg c$.

e) $\neg o \vee u$.

f) $\neg a \vee s$

(iii) Applying Inference Rules:-

a) if s then s ; a = s  $S \rightarrow C$
b) b or a ; $b \Rightarrow b \vee a$
c) if b then y ; $c \Rightarrow b \rightarrow y$
d) not c ; $d \Rightarrow \neg c$
e) if o then u ; $e \Rightarrow o \rightarrow u$
f) if a then s ; $f \Rightarrow a \rightarrow s$

$g \Rightarrow \neg s = a$, d node follow
$h \Rightarrow \neg a = f$, 7 node follow.

Q4. Write the FOL for the following:-

(i) Every child loves every candy.
$\Rightarrow \forall x \forall y (Child(x) \wedge Candy(y) \rightarrow loves(x,y))$

(ii) Anyone who loves some candy is not a nutrition fanatic.
$\Rightarrow \forall x \in (\exists y (Candy(y) \wedge loves(x,y)) \rightarrow \neg fanatic(x))$

(iii) Anyone who eats only pumpkin is a nutrition fanatic.
$\Rightarrow \forall x ((\exists y\, pumpkin(y) \wedge Eat(x,y)) \rightarrow fanatic(x))$.

(iv) Anyone who buys any pumpkin either carries it or eats it.
$\Rightarrow \forall x \forall y (pumpkin(y) \wedge buy(x,y) \rightarrow (carr(x,y) \vee Eat(x,y))$