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Artificial Intelligence

Vishal
MT18019

1. a)

$\exists x \exists y$ chocolate$(x) \wedge$ muffin$(x) \wedge$ chocolate$(y) \wedge$ muffin$(y) \wedge \neg(x=y) \wedge \forall(z)($chocolate$(z) \wedge$ muffin$(y)) \longrightarrow ((x=z) \vee (y=z))$

b) $\forall x \forall y$ cat$(x) \wedge$ Smart rat$(y) \longrightarrow \neg$ likes$(x,y)$

c) $F(x)$: English average of class $x$
$M(x)$: Maths average of class $x$

$\forall(x)\left(E(x) \wedge M(x) \longrightarrow E(x) > M(x)\right)$

d) $D(x)$: diamond ornament
$P(x)$: platinum ornament.

$\forall x\ D(x) \vee P(x) \longrightarrow$ Precious$(x)$.

e) $\forall x\ (\neg S(x) \longrightarrow (S(x) \longrightarrow P(x)))$

~~$x$: assignment in AI course~~

$S(x)$: Submit assignment $x$
$P(x)$: pass with good grades in course $x$

f) $A(x)$ : $x$ is angry
$H(x)$ : $x$ is hungry
$S(x)$ : $x$ is shark
$W(x)$ : $x$ is whale.

$\forall(x) \quad (A(x) \vee H(x)) \wedge (S(x) \vee W(x)) \longrightarrow Attack(x)$

g) $F(x)$ : $x$ is a fish
$S(x)$ : $x$ swims

$\exists x \neg(F(x) \wedge \neg S(x))$

h) $time(t)$ : at time $t$
$Candies(c)$ : $c$ is a candy
$eat(c,t)$ : eat candy $c$ at time $t$.

$\forall t \; time(t) \wedge \exists c \; candies(c) \wedge eat(c,t) \wedge$

$\forall c \; candies(c) \wedge \exists t \; time(t) \wedge eat(c,t) \wedge$

$\neg(\forall c \; candies(c) \wedge \forall t \; time(t) \wedge eat(c,t))$

i) $fan(x)$ : $x$ is a fan
$likes(x,y)$ : $x$ likes $y$
$killer(y)$ : $y$ is a killer
$\exists x \; fan(x) \wedge \forall y \; superhero(y) \wedge likes(x,y)$
$\longrightarrow \neg killer(y)$

j) ShopKeeper(y): y is a shopkeeper
Customer(x): x is a customer
member(x): x has membership
Sells(x,y): x sells to y.

$\exists y$ ShopKeeper(y) $\wedge \forall x$ customer(x) $\wedge$ member~~ship~~(x) $\longrightarrow$ Sells(y,x).

2. → Initial state -

Initial board (board1)
Vam at (1,1) $\wedge$ Harm at (8,8)

→ Final state -

Final board (board 2)

→ Actions -

1. Move Harm ($x_1, y, x_2$)

Precondition -
Harm at location ($x_1, y$)
Is Empty Path ($x_1, y, x_2, y$)

Effects -
Not (At location ($x_1, y$))
Not (Is Empty path ($x_1, y, x_2, y$))
Harm at location ($x_2, y$)

2. MoveVarm $(x_1, y_1, x_2, y_2)$

Precondition -
Varm at location $(x_1, y_1)$
Is Empty path $(x_1, y_1, x_2, y_2)$

Effects -
Not (At location $(x_1, y_1)$)
Not (Is Empty path $(x_1, y_1, x_2, y_2)$)
Varm at location $(x_2, y_2)$

3. Pick object $(x_1, y_1)$

Precondition -
Is object at $(x_1, y_1)$
Is Harm at $(x_1, y_1)$ V Is Varm at $(x_1, y_1)$
Is object(Q)

Effects -
Object picked()
Not (Harm at location $(x_1, y_1)$)
Not (Varm at location $(x_2, y_1)$)
Not (Is object at $(x_1, y_1)$)

4. Burst object $(x_1, y_1)$

Precondition -
is object(x)
Is object at location $(x_1, y_1)$
Is Varm at location $(x_1, y_1)$
Is Varm empty()

Effects -

Object bursted ( )
Not ( Is Varm empty ( ) )
Not ( Is Varm at location ( $x_1, y_1$ ) )
Not ( Is object (X) )

5. Shift Harm ( $x_1, y_1, x_1, y_2$ )

Precondition -
Is Harm at ( $x_1, y_1$ )
Is Varm at ( $x_1, y_1$ )
Is Varm Empty ( ).

Effects -
Not ( Is Harm at ( $x_1, y_1$ )
Not ( Is Varm Empty ( ) )
Not ( Is Varm at ( $x_1, y_1$ )

6. Shift Varm ( $x_1, y_1, x_2, y_1$ )

Precondition -
Is Harm at ( $x_1, y_1$ )
Is Varm at ( $x_1, y_1$ )
Is Harm empty ( )

Effects -
Not ( Is Harm at ( $x_1, y_1$ )
Not ( Is Varm at ( $x_1, y_1$ )
Not ( Is Harm Empty ( ) )

7. Drop Object $(x_1, y_1)$

Pre Condition:-
isLocation empty $(x_1, y_1)$
Is Harm at $(x_1, y_1)$
Is Object (O)

Effects -
Not (IsLocation empty $(x_1, y_1)$)
Not (Is Harm at $(x_1, y_1)$)
Not (Is Object (O))

3. Initial state -
~~ts.SeminarReceived~~

Is Seminar Required() ∧ Hall not Booked() ∧
Is Head Committe (me) ∧ Fund Not received() ∧
Lecturer not invited()

Actions -

1. Invite Professor(X). // Academics.

Precondition -
Is Professor available (X)

Effects -
Not (Is Professor available (X))
Professor Invited()

2. Book Hall (H). // Academics

Precondition -
IsHall (H)
IsHall available (H)

Effects -
Not (IsHall (H)) , Hall booked()
Not (IsHall available (H))

3. Request fund() // Accounts

Precondition -
Documents done() , Fund received()
Is Fund available()

Effects -
Not (Documents done())
Not (IsFund available())

4. Clean Hall (H) // FMS

Precondition -
Is Hall dirty (H) , IsHall available (H)

Effects -
Hall cleaned() , Not (IsHall available (H))

5. Arrange Security(). // Security

Precondition -
Is Security required().

Effects -
Security arranged( )
Not (Is security required( ))

6. Facility Required( ) // IT

Pre condition -
IsProjector Required( )
Is Speaker Required( )
Is Projector Available( )
Is Speaker available( )

Effects -
Projector Issued( )
Speaker Issued( )
Not (IsProjector available( ))
Not (Is Speaker available( ))

7. Fixed Date( d) // Academics

Precondition -
Date not fixed( )

Effects -
date fixed(d)
Not (date fixed(d))

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4. FoI statement -

C(x): X is chenopodium paratha
R(x): X is radish paratha
Eat(x): You eat X.
Likes(x): You like X.
O(x): You ordered X
P(x): X is paratha
Picky: You are picky
H: You will go hungry

1. $\exists x \exists y (P(x) \wedge P(y)) \wedge (C(x) \vee R(y)) \wedge x \neq y) \wedge \forall z (P(z) \rightarrow (z=x \vee z=y))$

2. ~~$\forall x (Likes(x) \rightarrow O(x))$~~
$\forall x (Likes(x) \wedge (R(x) \vee C(x)) \rightarrow O(x))$

3. ~~$P(x) \wedge$~~

$\forall x (Picky \rightarrow \neg Eat(R(x)) \vee \neg Eat(C(x))$

4. $\forall x \neg Eat(x) \rightarrow H.$

Statement 3 is true, it implies I don't like Chenopodium or radish paratha.

Statement 1 is true means Somdatta only has chenopodium and radish paratha.

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Statement 2 ~~no~~ is true means I will not order anything from the restaurant.

Statement 1 is true means ~~not~~ I didn't order anything. And so will not eat anything

∴ I will sleep hungry tonight.