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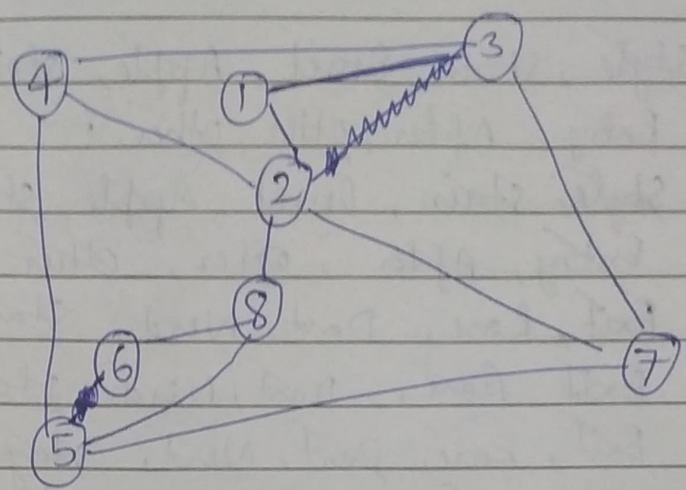
Soln:- 1:-

(a)



domains :-

D1 : Style, stain, Onset, Apple, Store, stone, Entry, After, Otter, other,

D2 : Style, stain, Onset, Apple, store, stone, Entry, After, otter, other

D3 : Exit, Rare, Dart, Nerd, Stay, Star, Ante

D4 : Exit, Rare, Dart, Nerd, Stay, Star, Ante

D5 : Exit, Rare, Dart, Nerd, stay, Star, Ante

D6 : Are, End, Art, Add, Rod

D7 : Are, End, Art, Add, Rod

D8 : Exit, Rare, Dart, Nerd, Stay, Star, Ante

Edges (for constraints) :-

D1 & D2, ~~D2 & D3~~, D2 & D4, D3 & D4, D2 & D8, D8 & D6, ~~D6 & D5~~, D5 & D4, D5 & D7, D2 & D7, D5 & D8, D3 & D7, D1 & D3.

(b) On applying arc consistency,

D1: ~~Style~~, Stain, ~~Onset~~, ~~Apple~~, Store, stone, ~~Entry~~, ~~After~~, ~~otter~~, ~~other~~.

D2: ~~Style~~, ~~stain~~, Onset, ~~Apple~~, ~~Store~~, ~~Stone~~, ~~Entry~~, After, otter, ~~other~~

D3: ~~Exit~~, Rare, Dart, Nerd, ~~Stay~~, ~~Star~~, ~~Ante~~

D4: ~~Exit~~, ~~Rare~~, ~~Dart~~, ~~Nerd~~, ~~Stay~~, Star, ~~Ante~~

D5: ~~Exit~~, ~~Rare~~, ~~Dart~~, ~~Nerd~~, ~~Stay~~, ~~Star~~, Ante

D6: Are, ~~End~~, Art, Add, ~~Rod~~

D7: Are, End, Art, Add, Rod

D8: Exit, ~~Rare~~, Dart, ~~Nerd~~, ~~Stay~~, ~~Star~~, ~~Ante~~

∴ only possible D5 : Ante
domains only possible who are not crossed in above arc consistency.

∴ Remaining

D1: Stain, Store, Stone.

D2: Onset, After, otter

D3: Rare, Dart, Nerd

D4: Star

D5: Ante

D6: ~~Are~~, ~~End~~, ~~Art~~, Add

D7: ~~Are~~, End, ~~Art~~, ~~Add~~, ~~Rod~~

D8: ~~Exit~~, Dart

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(c) D1 : stain, ~~store~~, ~~stone~~
D2 : After, ~~otter~~
D3 : ~~Rake~~, ~~Dart~~, Nerd
D4 : Star
D5 : Ante
D6 : Add
D7 : End
D8 : Dart

∴ Solutions :-
D1 : Stain , D3 : Nerd , D5 : Ante
D2 : After , D4 : Star , D6 : Add
D7 : End , D8 : Dart

(d) we only have to ensure that 2nd letter of 6 will be 1st letter of 8.

D6 : odd , ads

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Sol^n:- 2:- Deduction System being sound & complete:-
An inference rule of this kind is said to be unsound. A deduction system that contains such a rule is unsound.
Now, an inference rule is sound if the conclusions one can infer from any set of well formed formula using the rule are logical consequence of the set of well formed formula.
A deduction system is sound if it contain only sound inference rules.

Completeness means that the algo can take all possible inputs and doesn't miss any.
if the deduction system doesn't give a result for some particular input, it isn't complete.
Resolution refutation is a sound algo because it always gives a ~~const~~ correct ans. It can prove false if it resolves to a contradiction or run out of steps which can correctly determine whether the statement true or false.
It is also complete because there is no possible input for which resolution refutation cannot give an output. It will always return a value and hence it is complete.

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Sol^n: 3:- (a)

predicates:-

$P(x, y)$: x played for team y
$C(x, y)$: x is captain of team y
$F(x, y)$: x & y are friend
$D(x, y)$: x disliked y
$B(x, y)$: x betrayed y.

(b) F1 : $P(\text{pritam}, \text{bigteam})$
F2 : $C(\text{mohan}, \text{bigteam})$
F3 : $\forall x [P(x, \text{bigteam}) \rightarrow F(x, \text{mohan}) \vee D(x, \text{mohan})]$
F4 : $\forall x \forall y [F(x, y) \rightarrow \neg B(x, y) \wedge \neg B(y, x)]$
F5 : $\forall x \forall y [B(x, y) \rightarrow \neg F(x, y)]$
F6 : $B(\text{pritam}, \text{mohan})$
G : $\exists x \exists t \; D(\text{pritam}, x) \wedge C(x, t) \wedge P(\text{pritam}, t)$

(c) F1 : $P(\text{pritam}, \text{Bigteam})$: C1
F2 : $C(\text{mohan}, \text{bigteam})$: C2
F3 : $\forall x [\neg P(x, \text{bigteam}) \vee F(x, \text{mohan}) \vee D(x, \text{mohan})]$

$\Rightarrow \neg P(x, \text{bigteam}) \vee F(x, \text{mohan}) \vee D(x, \text{mohan})$: C3

F4 : $\forall x \forall y [\neg F(x, y) \vee (\neg B(x, y) \wedge \neg B(y, x))]$

$\Rightarrow \neg F(x, y) \vee \neg B(x, y) \vee (B(y, x)))]$: C4

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F5 : $\neg B(x, y) \vee \neg F(x, y)$: C5

F6 : $B(pritam, mohan)$: C6.

$\neg G$: $\neg [\exists x \exists t \; D(pritam, x) \wedge C(x, t) \wedge P(pritam, t)]$

$\Rightarrow \forall x \forall t \; (\neg D(pritam, x) \vee \neg C(x, t) \vee \neg P(pritam, t)$

$\Rightarrow \neg D(Pritam, x) \vee \neg C(x, t) \vee \neg P(pritam, t)$

: C7