CS 188 Fall 1991 | Introduction to AI Stuart Russell | **Final solutions**

1. (12 pts.) Definitions

(a) Consistency: no contradictions, hence can be true in some world in some interpretation

(b) Plan steps not totally ordered during planning process

(c) Behaviour maximizes utility

(d) Search to resolve uncertainty in the evaluation of a leaf node in a game tree

(e) Grammar rules have single nonterminal on lhs

(f) Plethora of preconditions on action description axioms

2. (10 pts.) Logic *True/false*:
F T F F F F

3. (8 pts.) KR *Multiple choice*:
b) d)

4. (15 pts.) Search

(a) *True/false*: True

(b) You should work this out

(c) Each iteration through dfs examines all nodes with f-value less than bound. There are k total iterations, because there are k nodes with f-value $\leq f(goal)$. Hence we have $1 + 2 + 3 \cdots + k = (k^2)/2$.

5. (14 pts.) Planning *Multiple choice*:
d) e) f)

6. (5 pts.) NLP

(a) Convention for structuring symbol "strings" prior to placing in correspondence with meanings. Allows combinatorial number of meanings from linear number of symbols

(b) Should mention, say, p hears x, p trusts x, s in language understood by p, postconditions: add p knows content(s), delete ¬knows(content(s))

7. (13 pts.) Logic/NLP

(a) The grammar should allow for variable lists after quantifiers; cover exists, all, and, or, not implies, (pred term*), term = (func term*) — const — var plus examples of (pred const func var) that look reasonable

(b) according to a).

8. (10 pts.) Concept learning *True/false*:
F F T F T

9. (13 pts.) Probabilistic reasoning

(a) Icy → FrozenBattery → CarWon'tStart ← Nogas

(b) F (only the probability distribution is fixed)

(c) $P(Frozen|Icy) = 0.2$ (anything reasonable here)
$P(Frozen|\neg Icy) = 0$ $P(CarWontStart|Nogas \vee FrozenBattery) = 1$
$P(CarWontStart|$
$lnotNogas \wedge \neg FrozenBattery) = 0.01$ (say)

(d) 15 (16 - 1 for sum to 1)

(e) 8 (1 per prior + 2 for frozen + 4 for Car: each conditioning context must sum to 1.)

(f) Predecessor of CarWon'tStart. Reduce value for all-false; copy other values.

(g) all-false is some small prior; other values are all 1 for T, 0 for F (basically like an OR gate with an unknown extra bit)