Test Bank- MID AI

Questions:

Q1: Express each of the following English sentences in First-Order Predicate Calculus:

1. Every student walks or talks.

2. someone walks and someone talks.

3. All prime integers are non-negative.

4. If anyone cheats, s/he suffers.

5. There is something that nobody wants.

6. Everyone loves himself.

7. Not every green dragon is sleeping.

8. All birds that are not penguins fly.

9. Every cat is larger than a dog.

10. Only frogs are green or yellow.

11. John is shorter than someone (e.g. a person) that knows sami.

12. X and Y are cousins if one of the parents of X shares a common parent with a parent of Y.

13. Sami visited a shop in Amman.

14. Not every IT student who took E(E names an exam) obtained a good mark.

Q2: Show that $\neg[p \vee \neg(\neg q \vee \neg r)]$ is logically equivalent to $(p \vee q) \rightarrow \neg(p \vee r)$.

Q3: Consider the following prolog programs, trace the program and find the output of the goal statements.

Prolog program (A)	Goal and answer
a(x):- f(x). a(x):- b(x). b(x):- g(x), v(x). b(x):- v(x). g(11). g(3). v(44). f(5).	?- a(x).

Prolog program (B)	Goal and answer
father(ahmad, basema). mother(basema, Laila). father(ahmad, kamal). father(kamal, rami). father(rami, jamil). father(ahmad, walid). father(walid, zaid). grandfather(X,Z):- father(X,Y), mother(Y,Z). grandfather(X,Z):- father(X,Y), father(Y,Z).	?- grandfather(R, laila). ?- father(X, laila). ?- mother(X, laila).

Q4: What is the answer to each of the following queries?

#	Query	Answer
a.	?- [a, b, c, d]= [a, b, [c, d]].	Answer:
b.	?- [a, b, c, d]= [a, b, c, d|[]].	Answer:
e.	?- Y= 7, Y is 2+5.	Answer:
d.	?- [f(a), [c, f(b)]]= [X|Y].	X=
e.	?- z(f(b), X)= z(Y, d(b)).	X=

f.	?- X=2+1, Y=3+X, Z is X+Y.	Z=

Q5: Write in prolog each of the following clauses:

a. Split a list into two parts; the length of the first part is given.

Example: ?- split([a, b, c, d, e, f, g, h, i, k], 3, L1, L2).

L1= [a, b, c].

L2= [d, e, f, g, h, I, k].

b. Write a predicate range to generate all integers between a given lower and a given upper bound. If the upper bound specified is lower than the given lower bound, the empty list should be returned. Examples:

?- range(3, 11, X). X= [3, 4, 5, 6, 7, 8, 9, 10, 11].	?- range(7, 4, X). X=[].

Q6: Write in Prolog the following relations/predicates:

1. repl(A, L, N) which takes an integer number A and a list of integer numbers L and returns a list L1 where every even number in L is replaced by A.

Example: repl(10, [1, 5, 2, 5, 3, 5, 4, 5], K) returns K=[1, 5, 10, 5, 3, 5, 10, 5].

2. full-sibling(A, B) which returns true if:

(1) A is different from B (in prolog can be expressed as A\=B).

(2) A and B have the same father and the same mother.

Example: if we have the following predicates:

father(a, b), mother(b, r), father(a, k), mother(b, k) then the interpreter answer to the query full-sibling(b,r) will be true.

Q7: Answer by true or false.

_____ [g(x)&(h(Z,X)→h(Z, Y)]→s(X, Y) is equivalent to ¬g(x)∨(h(Z, X)& ¬h(Z, Y)) ∨s(X, Y).

_____ ¬(∃x)(A(x)→(B(x)&C(x)) is equivalent to (∀x)(A(x)&(B(x)→ ¬X(x).

_____ [A→(B→C)] is equivalent to [B&¬C→¬A].

Q8: What is the prolog interpreter answer to each of the following queries:

1. ?- X=:=3+5. _____

2. ?- X=2, Y=3, Z= X+Y. _____

3. ?- X= [2, 3, [4, 5]], X=[2, 3|Y]. _____

4. ?- p(X, q(Y), r(Z))= p(r(a), q(X), r(b)). _____

5. father(P1, P2)= father(X, john). _____

6. [X, Y]= [a, b|Z]. _____

Q9: What is the value of each of the Zi's in each of the following prolog clauses?

1. d(X, N, [], []).

   d(X, N, L, L):- N<0.

d(X, 0, L, L).

d(X, N, [X|L], L1):- N1 is N-3, d(X, N1, L, L1).

d(X, N, [Y|L], [Y|L1]):-N1 is N-2, d(X, N1, L, L1).

?- d(8, 8, [8, 9, 10, 8, 12, 80, 8, 15, 16], Z3).

Z3=_____.

2. r(X, 1, L, [X|L]).

r(X, N, [Y|L], L1):- N1 is N-1, r(X, N1, L, L1).

?- r(a, 8, [a, b, d, e, c, e, f, g, h, i], Z4).

Z4= _____.