Answer all questions

1. a) What is the different between the propositional calculus and predicate calculus? Explain by examples.

   b) For propositional expressions P, Q and R prove that:
      i) $(P \vee Q) \equiv (\neg P \rightarrow Q)$.
      ii) $(P \rightarrow Q) \equiv (\neg Q \rightarrow \neg P)$.
      iii) $\neg (P \vee Q) \equiv (\neg P \rightarrow \neg Q)$.

   c) Represent the following English sentences in predicate calculus:
      i)   If it doesn't rain on Friday we will go to the park.
      ii) Emma is a Doberman pinscher and a good dog
      iii) All basketball players are tall.
      iv) Nobody likes taxes.

2. a) Write the unification algorithm of two terms.

   b) For the following term, give the output tree of the unification if it unify or else explain why unification would fail:
      Unify ((parents X (father X) (mother bill)), (parents bill (father bill) Y))

   c) Given the following
      i)   if it is sunny and it is warm, then Sami is happy.
      ii) if there is blue sky then it is sunny.
      iii) there is blue sky.
      iv) it is warm.
      v)   is Sami happy?

      Use resolution to show Sami is happy

3. a) What is the difference between knowledge acquisition and knowledge elicitation? List some of knowledge elicitation techniques?

   b) Draw a diagram and discuss the architecture of a typical expert system for a particular problem domain.

   c) Consider the following rules:
      Rule1: if the engine is getting gas, and the engine will turn over,
             then the problem is spark plugs.
      Rule2: if the engine does not turn over, and the lights do not come on,
             then the problem is battery or cables.
      Rule3: if the engine does not turn over, and the lights do come on
             then the problem is the starter motor.
      Rule4: if there is gas in the fuel tank, and there is gas in the carburetor
             then the engine is getting gas.
      Suppose *gas in the fuel tank = yes, gas in the carburetor = yes, and the engine will turn over = yes*, simulate the following:
      i)   The back chain and its explanation model by the goal "*the problem is X*".
      ii) The forward chain