Benha University
Faculty of Computer & Information Sciences
Artificial Intelligence **May 2009**
Third Year **Second Semester**
Time: 3 Hours **Final Exam**

Answer all questions

Question 1:

a. The logical operator "↔" is read "if and only if." P ↔ Q is defined as being equivalent to (P → Q) ^ (Q → P). Based on this definition, show that P ↔ Q is logically equivalent to (P v Q) → (P ^ Q) By using truth tables.

b. Prove that implication is transitive in the propositional calculus, that is, that ((P → Q) ^ (Q → R)) → (P →R).

Question 2:

a. For the following term, give the output tree of the unification if it unify or else explain why unification would fail:
Unify ((parents A (father A) (mother aly)), (parents aly (father aly) B))

b. Given the following statements
if it is sunny and it is warm, then Samy is happy.
if there is blue sky then it is sunny.
there is blue sky.
it is warm.
is Samy happy?
Use resolution to show Samy is happy

Question 3:

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

b. 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

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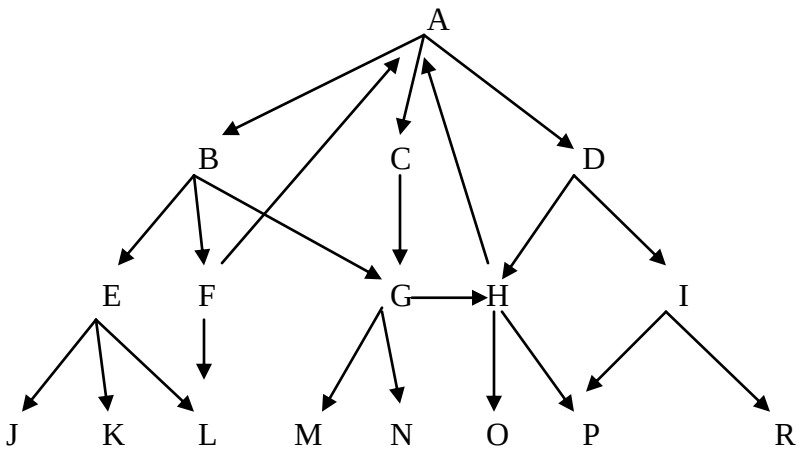
Question 4:

"Hand run" the backtrack algorithm on the following graph. Begin from state A. Keep track of the successive value of NSL, SL, CS and DE.



Where SL for state list, NSL for new state list, CS for current state and DE for dead ends.

Question 5:

a. Represent the following statement in Semantic Net representation
   All robins are birds.
   Clyde is a robin, and robin is a bird.
   Birds have wings.
   All Birds have Nests.
   Clyde owned Nest from spring to fall.

b. Define the Frames as a knowledge representation technique. Give examples.