CS3723 Pgm 4 LISP - Diagnosis Tree

In this LISP assignment, you will provide a medical diagnosis based on a patient's symptoms.

Example Medical Diagnosis Tree:

Q1 Question: PAIN ?

Y: Q5 Question: TENDERNESS IN ABDOMEN ?

Y: Q8 Question: X-RAY SHOWS STONES ?

Y: D9 Diagnosis: TREAT KINDEY STONES

N: D8 Diagnosis: SCHEDULE APPENDECTOMY

N: Q6 Question: PAIN IN THROAT ?

Y: D7 Diagnosis: ADMINISTER STREP TEST

N: Q7 Question: FEVER ?

Y: D6 Diagnosis: TREAT FLU

N: D5 Diagnosis: PRESCRIBE ACETAMINOPHEN

N: Q2 Question: COUGH ?

Y: D1 Diagnosis: TREAT COMMON COLD

N: Q3 Question: FEVER ?

Y: D2 Diagnosis: TREAT FLU

N: D3 Diagnosis: THANK YOU FOR VISITING

Suppose patient "Alice" has simply a "fever". Based on the diagnosis tree:

Q1: Pain ? N

Therefore, we ask

Q2: Cough ? N

Therefore, we ask

Q3: Fever? Y

So, the diagnosis is "treat flu"

Suppose patient "Bob" has the symptom "tenderness in abdomen", what happens? First, we realize the "tenderness in abdomen" is a type of pain when we see the symptom.

Q1: Pain ? Y

Therefore, we ask

Q5: TENDERNESS IN ABDOMEN? Y

Therefore, we ask

Q8: X-RAY SHOWS STONES ? N

So, the diagnosis is "SCHEDULE APPENDECTOMY "

In our use of the diagnosis tree, the medic would have done the x-ray and then known an answer to Q8. In our execution we will only know the symptoms before going through the tree.

We will represent the diagnosis tree using a hash table entry for each node in the tree:

Q1: an entry in a question-HT:

key: Q1

value: (Q5 Q2 PAIN)

Q2: an entry in a question-HT:

key: Q2

value: (D1 Q3 COUGH)

Q5: an entry in a question-HT:

key: Q5

value: (Q8 Q6 TENDERNESS IN ABDOMEN)

D1: an entry in a diag-HT:

key: D1

value: (TREAT COMMON COLD)

**Needed hash tables**:

**question-HT** - each entry represents a question as three values: ID for Y, ID for N, question

**diag-HT** - each entry represents a diagnosis which is a list of atoms

**isa-HT** - for a type of symptom, it maps it to higher concept. For example, (tenderness in abdomen) is a pain.

**symptom-HT** - each entry represents a patient's current symptoms. Examples:

Alice: (FEVER) - T

Bob: (TENDERNESS in ABDOMEN) - T

and also (based on the isa-HT)

(PAIN) - T

I provided two LISP files:

**p4LispDef.txt** - execute this first (before loading your functions)

* It defines:
  + putp - function to put a property in a hash table for a key value
  + getp - function to get a property from a hash table for a key value
  + question-HT
  + diag-HT
  + symptom-HT
  + isa-HT
  + qyn - macro to put a question into the question-HT hash table.
  + clearSymptoms - clears (deletes) all entries in symptom-HT

**p4LispRun.txt** - execute this after you have loaded your functions

* It uses QYN, DIAG, and ISA to create the diagnosis tree and isa information.
* It uses printTree, clearSymptoms, symptom, and triage to exercise that functionality.

You must code these **macros**:

**diag** similar to qyn except it puts the entry in diagnosis-HT.

(diag *diagnosisID* *diagnosis*) uses putp to record the *diagnosisID* as the key and *diagnosis* (which can be many atoms) as the value in the diagnosis-HT.

Example: (DIAG D1 Treat common cold) would record

* D1 (treat common cold) in diag-HT

**isa** puts an entry in the isa-HT. Please examine the example above.

(isa *expr type*) uses putp to record the *expr* (which can be an atom or a list) as the key and *type* as the value in the isa-HT.

Example: (isa (tenderness in abdomen) pain) would record

* (tenderness in abdomen) (pain) in isa-HT

**symptom** puts an entry in the symptom-HT. If the symptom has an isa in the isa-HT, it also inserts an entry for that isa in the symptom-HT.

(symptom *symptom*) uses putp to record the *symptom* as the key and T as the value in the symptom-HT. Additionally, if *symptom* is a type, it records that the patient has that type as a symptom.

Example: (symptom tenderness in abdomen) would actually record two symptoms since (tenderness in abdomen) is a (pain):

* (tenderness in abdomen) T in symptom-HT
* (pain) T in symptom-HT

You must code these functions:

**printTree** prints a nicely diagnosis definition tree (as shown above)

(printTree *rootId*) is passed the ID of the root of the diagnosis tree and prints the diagnosis tree like what is shown above. This will probably also use your princWOP function. Hint: printTree probably should call another function to recursively print indented nodes of the tree.

**triage** shows the execution of the diagnosis tree based on the symptoms and returns the diagnosis or NIL (if there isn't one). This will probably use your printWOP function. See the sample output.

Notes:

1. If you want to examine the contents of a hash table, simply enter its name in the high-level read loop:

diag-HT

1. Some built-in output functions:

* (princ arg1 arg2 ...) - prints each argument separated by spaces. It does not follow it ba a linefeed.
* (terpri) - prints a linefeed.

1. You can only use the functions/macros we discussed in the LISP notes, pgm #2, pgm#3, and macros/functions in this assignment.
2. Load my definitions using (load "p4LispDef.txt" :echo T :print T). Load your code using   
   (load "**p4Lisp.txt**" :echo T :print T).   
   To execute on the test cases using the file I provided:   
   (load "p4LispRun.txt" :echo T :print T)
3. Your functions must be executed on a **fox** server using the specified test cases.
4. Turn in a zip file named LastNameFirstName.zip (no spaces) containing:
   * Your source LISP code named p4Lisp.txt
   * Your log of the session (see the setup instructions). This should be a .txt file.
5. Your code must follow my LISP programming standards.

**Sample Partial Output**:

(setf ROOT 'Q1)

Q1

(printTree ROOT)

Q1 Question: PAIN ?

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N: Q2 Question: COUGH ?

Y: D1 Diagnosis: TREAT COMMON COLD

N: Q3 Question: FEVER ?

Y: D2 Diagnosis: TREAT FLU

N: D3 Diagnosis: THANK YOU FOR VISITING

NIL

(Symptom fever)

NIL

(symptom pain in throat)

NIL

(triage)

ID: Q1 (Q5 Q2 PAIN) Y

ID: Q5 (Q8 Q6 TENDERNESS IN ABDOMEN) N

ID: Q6 (D7 Q7 PAIN IN THROAT) Y

(ADMINISTER STREP TEST)