**Question bank with Answers**

**Unit-02**

**PROPOSITIONAL LOGIC**

What is propositional logic?

It is a way of representing knowledge. In logic and mathematics, a propositional calculus or logic is a formal system in which formulae representing propositions can be formed by Combining atomic propositions using logical connectives. Sentences considered in propositional logic are not arbitrary sentences but are the ones that are either true or false, but not both. This kind of sentences are called propositions. Example Some facts in propositional logic: It is raning. - RAINING It is sunny - SUNNY It is windy - WINDY If it is raining ,then it is not sunny - RAINING -> SUNNY

What are the elements of propositional logic?

Simple sentences which are true or false are basic propositions. Larger and more complex sentences are constructed from basic propositions by combining them with connectives. Thus propositions and connectives are the basic elements of propositional logic. Though there are many connectives, we are going to use the following five basic connectiveshere:NOT, AND, OR, IF\_THEN(orIMPLY), IF\_AND\_ONLY\_IF. They are also denoted by the symbols: , , , , , respectively.

Define Generalized Modus ponens.

In Boolean logic, with the rule ``IF X is A THEN Y is B'', the proposition X is A has to be observed to consider the proposition Y is B. In fuzzy logic, a proposition ``X is '', close to the premise ``X is A'' can be observed to provide a conclusion ``Y is '' close to the conclusion ``Y is B ''. A simple fuzzy inference can be represented as: Rule : IF X is A THEN Y is B Fact : X is Conclusion : Y is B

Define Logic

Logic is one which consist of i. A formal system for describing states of affairs, consisting of a) Syntax b)Semantics. ii. Proof Theory – a set of rules for deducing the entailment of a set sentences

What is entailment?

Propositions tell about the notion of truth and it can be applied to logical reasoning. We can have logical entailment between sentences. This is known as entailment where a sentence follows logically from another sentence. In mathematical notation we write : alphta |=beta

Define First order Logic?

First-order logic (like natural language) assumes the world contains Objects: people, houses, numbers, colors, baseball games, wars, … Relations: red, round, prime, brother of, bigger than, part of, comes between, … Functions: father of, best friend, one more than, plus, …

What are quantifiers?

There is need to express properties of entire collections of objects,instead of enumerating the objects by name. Quantifiers let us do this. FOL contains two standard quantifiers called a) Universal () and b) Existential ()

Explain the connection between  and 

“Everyone likes icecream“ is equivalent”, “there is no one who does not like ice cream” This can be expressed as : x Likes(x,IceCream) is equivalent to  Likes(x,IceCream)

What are the levels in Structuring of knowledge?

(i) The knowledge level at which facts are described (ii)The symbol level at which representation of objects at knowledge level are defined in terms of symbols

What are the four properties for knowledge representation ?

Representational adequacy . Inferential adequacy . Inferential efficiency . Acquisitional efficiency

What is predicate calculus?

Predicate Calculus is a generalization of propositional calculus.Hence besides terms, predicates, and quantifiers, predicate calculus contains propositional variables, constants and connectives as part of the language

What is frame problem?

The whole problem of representing the facts, the change as well as those

that do not is known as frame problem

What are frames?

A frame is a collection of attributes and associated values that describe

some entity in the world.

Difference between Logic programming and PROLOG.

 In logic, variables are explicitly quantified. In PROLOG,

quantification is provided implicitly by the way the variables are

interpreted

 In logic, there are explicit symbols for and, or. In PROLOG,

there is an explicit symbol for and, but there is none for or

 In logic, implications of the form “p implies q” are written as p.

q . In PROLOG, the same implication is written “backward” as

q:-p .

For the given sentence “All Pompians were Romans” write a well

formed formula in predicate logic. [MAY / JUNE 2016]

x Pompian(x) => Roman(x)

Define FOL.

FOL is a first order logic. It is a representational language of knowledge

which is powerful than propositional logic (i.e.) Boolean Logic. It is an

expressive, declarative, compositional language

Define an inference procedure

An inference procedure reports whether or not a sentence is entiled by

knowledge base provided a knowledge base and a sentence .An inference

procedure ‘i’ can be described by the sentences that it can derive. If i can

derive from knowledge base, we can write. KB --Alpha is derived from

KB or i derives alpha from KB.

Define backward chaining.

This algorithm works backward from the goal, chaining through rules to

find known facts that support the proof.

In backward chaining,we start from a conclusion,which is the hypothesis we

wish to prove,and we aim to show how that conclusion can be reached from the

rules and facts in the data base.The conclusion we are aiming to prove is called a

goal and the reasoning in this way is known as goal-driven.

What is forward chaining? [APRIL/MAY 2017, APR/MAY 2018]

Using a deduction to reach a conclusion from a set of antecedents is called

forward chaining. In other words, the system starts from a set of facts,and a set of rules,and tries to find the way of using these rules and facts to deduce

a conclusion or come up with a suitable course of action. This is known as

data driven reasoning.

What are the basic Components of propositional logic?

i. Logical Constants (True, False)

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Define AND –Elimination rule in propositional logic

AND elimination rule states that from a given conjunction it is possible

to inference any of the conjuncts.

Define a Proof

A sequence of application of inference rules is called a proof. Finding

proof is exactly finding solution to search problems. If the successor

function is defined to generate all possible applications of inference rules

then the search algorithms can be applied to find proofs.

With an example, show objects, properties functions and relations.

Example “EVIL KING JOHN BROTHER OF RICHARD RULED

ENGLAND IN 1200”

Objects : John, Richard, England, 1200 Relation : Ruled Properties :

Evil, King Functions : BROTHER OF

Define a Sentence?

Each individual representation of facts is called a sentence. The

sentences are expressed in a language called as knowledge representation

language.

Define certainty factor?

A certainty factor (cf), a number to measure the expert’s belief. The

maximum value of the certainty factor is, say, +1.0 (definitely true) and

the minimum –1.0 (definitely false).For example, if the expert states that

some evidence is almost certainly true, a cf value of 0.8 would be

assigned to this evidence.

What is fuzzy logic?

• The term fuzzy logic is used in two senses:

– Narrow sense: Fuzzy logic is a branch of fuzzy set theory, which

deals (as logical systems do) with the representation and

inference from knowledge. Fuzzy logic, unlike other logical

systems, deals with imprecise or uncertain knowledge. In this

narrow and perhaps correct sense, fuzzy logic is just one of the

branches of fuzzy set theory.

– Broad Sense: fuzzy logic synonymously with fuzzy set theory