JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- JUNE-2023

COURSE CODE(CREDITS): 21M11EC212 (3) MAX. MARKS: 35

COURSE NAME: ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

COURSE INSTRUCTORS: DR. NISHANT JAIN MAX. TIME: 2 Hour

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q1. Explain the difference between Propositional Logic and First Order Logic to represent knowledge in the knowledge-base of an AI agent.

[3]CO3

Q2. With respect to first order logic and with the help of suitable examples, explain the following terms:
   a. Constants and Variables.
   b. Functional Term.
   c. Predicates
   d. Quantifiers.

[1.5 X 4 = 6]CO3

Q3. Explain the following with the help of suitable example:
   a. How can Universal quantifier be removed from FOL, if possible?
   b. How can Existential quantifier be removed from FOL, if possible?
   c. How can Universal quantifier be introduced from FOL, if possible?
   d. How can Existential quantifier be removed from FOL, if possible?

[1 X 4 = 4]CO3

Q4. What do you understand with Horn sentences or Horn Clauses? Explain how FOL sentence with an existential quantifier can be converted into a Horn sentence?

[4]CO3

Q5. Explain the necessity of unifying the two FOL sentences. Explain how the following sentences can be unified:
   a. Teacher(Ankit,x) , Teacher(Ankit, Mohit)
   b. Teacher(Ankit,x), Teacher(y, Father(y))
   c. Teacher(Ankit,x), Teacher(x, Mohit)

[4]CO4

Q6. Represent the following in Propositional Logic and First Order Logic form:
   a. If a triangle is equilateral then it is isosceles.
   b. If a triangle is isosceles then 2 sides AB and AC are equal.
   c. If AB and AC are equal, then angle B and angle C are equal.

[2 X 3 = 6]CO4

Q7. Following facts are known:
i. If a perfect cube is divisible by a prime P, then it is also divisible by a cube of P.
ii. Every perfect cube is divisible by some prime number.
iii. 8 is a perfect cube.
Create a knowledge base of the above 3 facts given, and using first order logic determine if there exists a prime (q) such that the square of q divides 8.

[4]CO4

Q8. Write a short note on the following:
   a. PEAS for the AI agent.
   b. Fully and partially observable environment.

[2 X 2 = 4]CO1, CO2