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**SRM Institute of Science and Technology**

**SET B-AK**

**College of Engineering and Engineering and Technology**

**School of Computing**

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

**Academic Year: 2023-24 ODD**

**Test: CLAT 2**  **Date: 10.10.2023**

**Course Code & Title: 18CSE351T-Computational Logic**  **Duration:** 110 mins

**Year & Sem:** III & IV Year / V & VII Sem. **Max. Marks:** 50

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| **Q. No** | **Question** |
| 1 | State ad prove the derived rules for proof by contradiction |
| 2 | Prove the validity of the sequent using Propositional natural deduction  (p → q) → p  ⊢ (p → q) → q |
| 3 | 1. Use ¬, →, ∧ and ∨ to express the following declarative sentences in propositional logic; in each case state what your respective propositional atoms p, q, etc. mean   If the barometer falls, then either it will rain or it will snow     1. Draw the parse trees of the following formulas   (p ∧ q) → (¬ r ∨ (q →r)) |
| 4 | Use the predicate specifications  B(x, y) : x beats y  F(x) : x is an (American) football team  Q(x, y) : x is quarterback of y  L(x, y) : x loses to y  and the constant symbols  c : Wildcats  j : Jayhawks  to translate the following into predicate logic.  (a) Every football team has a quarterback.  (b) If the Jayhawks beat the Wildcats, then the Jayhawks do not lose to every football team.  (c) The Wildcats beat some team, which beat the Jayhawks. |
| 5 | Let c and d be constants, f a function symbol with one argument, g a function symbol with two arguments and h a function symbol with three arguments. Further, P and Q are predicate symbols with three arguments. Which of the following strings are formulas in predicate logic?   1. ∀x P(f(d), h(g(c, x), d, y)) - False 2. ∀x P(f(d), h(P(x, y), d, y)) - False 3. ∀x Q(g(h(x, f(d), x), g(x, x)), h(x, x, x), c) -Yes 4. ∃z (Q(z, z, z) → P(z)) -False 5. ∀x ∀y (g(x, y) → P(x, y, x)) -False 6. Q(c, d, c) -True |
| **Q. No** | **Question** |
| 6 | Prove the validity of the sequent   1. (p ∧ q) ∧ r   ⊢   s ∨ (q ∨ t)      1. ¬(¬p ∧ ¬q)   ⊢   p ∨ q      1. p ∧ q ⊢ (p → q) ∧ (q → p) |
| 7 | 1. For the given formula   ¬(∀x ((∃y P(x, y, z)) ∧ (∀z P(x, y, z))))  ∀x1∃x2((P1(x3) ∧ P1(x1)) → P1(x2))  (a) Draw the parse tree  (b) Identify all bound and free variable       1. Discuss the types of quantifiers in First Order Logic? |