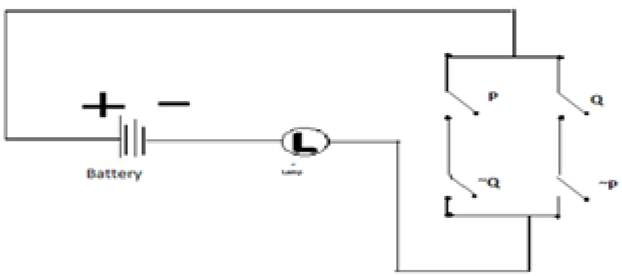
Assignment

1. Which of the following option is true?
   a) If the Sun is a planet, elephants will fly
   b) 3 +2 = 8 if 5-2 = 7
   c) 1 > 3 and 3 is a positive integer
   d) -2 > 3 or 3 is a negative integer
2. Let P: I am in Bangalore.; Q: I love cricket.; then q -> p(q implies p) is?
   a) If I love cricket then I am in Bangalore
   b) If I am in Bangalore then I love cricket
   c) I am not in Bangalore
   d) I love cricket
3. Let P: We should be honest., Q: We should be dedicated., R: We should be overconfident. Then 'We should be honest or dedicated but not overconfident.' is best represented by?
   a) $\sim P \vee \sim Q \vee R$
   b) $P \wedge \sim Q \wedge R$
   c) $P \vee Q \wedge R$
   d) $P \vee Q \wedge \sim R$
4. Let R (x) denote the statement "x > 2." What is the truth value of the quantification $\exists x R(x)$, having domain as real numbers?
   a) True
   b) False
5. Use De Morgan's Laws, and any other logical equivalence facts you know to simplify the following statements. Show all your steps. Your final statements should have negations only appear directly next to the sentence variables or predicates (P, Q, E(x), etc.), and no double negations. It would be a good idea to use only conjunctions, disjunctions, and negations.
   a) $\neg((\neg P \wedge Q) \vee \neg(R \vee \neg S))$.
   b) $\neg((\neg P \rightarrow \neg Q) \wedge (\neg Q \rightarrow R))$
6. We can also simplify statements in predicate logic using our rules for passing negations over quantifiers, and then applying propositional logical equivalence to the "inside" propositional part. Simplify the statements below (so negation appears only directly next to predicates).
   a. $\neg \exists x \forall y (\neg O(x) \vee E(y))$.

b. ¬∀x¬∀y¬(x<y∧∃z(x<z∨y<z)).
c. There is a number n for which no other number is either less n than or equal to n.
d. It is false that for every number n there are two other numbers which n is between.

7. Let domain of m includes all students, P (m) be the statement “m spends more than 2 hours in playing polo”. Express ∀m ¬P (m) quantification in English.
   a) A student is there who spends more than 2 hours in playing polo
   b) There is a student who does not spend more than 2 hours in playing polo
   c) All students spends more than 2 hours in playing polo
   d) No student spends more than 2 hours in playing polo
8. In the circuit shown the lamp will be glowing if _________



   a) P: True, Q: False
   b) P: True, Q: True
   c) P: False, Q: False
   d) None of the mentioned

9. A compound proposition that is always ___________ is called a tautology.
   a) True
   b) False
10. If A is any statement, then which of the following is a tautology?
   a) A ∧ F
   b) A ∨ F
   c) A ∨ ¬A
   d) A ∧ T

11. A compound proposition that is always ___________ is called a contradiction.
   a) True
   b) False

12. $\neg (A \lor q) \land (A \land q)$ is a ___________
    a) Tautology
    b) Contradiction
    c) Contingency
    d) None of the mentioned
13. $(A \lor \neg A) \lor (q \lor T)$ is a __________
    a) Tautology
    b) Contradiction
    c) Contingency
    d) None of the mentioned

14. $A \land \neg(A \lor (A \land T))$ is always __________
    a) True
    b) False
15. $A \rightarrow (A \lor q)$ is a __________
    a) Tautology
    b) Contradiction
    c) Contingency
    d) None of the mentioned