1. Which of the following connectives satisfy commutative law?
   a) $\wedge$               b) $\vee$               c) $\Leftrightarrow$               d) All the above

2. Which of the following propositions is a contradiction?
   a) $(\sim p \vee \sim q) \vee (p \vee \sim q)$    b) $(p \rightarrow q) \vee (p \wedge \sim q)$    c) $(\sim p \wedge q) \wedge (\sim q)$    d) $(\sim p \wedge q) \vee (\sim q)$

3. Let $p$ be the proposition Mathematics is interesting and let $q$ be the proposition that Mathematics is difficult, then the symbol $p \wedge q$ means
   a) Mathematics is interesting implies that Mathematics is difficult
   b) Mathematics is interesting implies and is implied by Mathematics is difficult
   c) Mathematics is intersecting and Mathematics is difficult
   d) Mathematics is intersecting or Mathematics is difficult

4. If $(p \wedge \sim r) \rightarrow (\sim p \vee q)$ is false, then the truth values of $p$, $q$ and $r$ are respectively
   a) T, F and F          b) F, F and T          c) F, T and T          d) T, F and T

5. If statements $p$ and $r$ are false and $q$ is true, then truth value of $\sim p \Rightarrow (q \wedge r) \vee r$ is
   a) T               b) F               c) Either T or F          d) Neither T nor F

6. Let $p$ and $q$ be two statements, then $(p \vee q) \vee \sim p$ is
   a) Tautology          b) Contradiction          c) Both (a) and (b)          d) None of these

7. the contrapositive of "If two triangles are identical, then these are similar" is
   a) If two triangles are not similar, then these are not identical
   b) If two triangles are not identical, then these are not similar
   c) If two triangles are not identical, then these are similar
   d) if two triangles are not similar, then these are identical

8. Simplify the following circuit and find the boolean polynomial.

a) $p\lor(q\land r)$          b) $p\land(q\lor r)$          c) $p\lor(q\lor r)$          d) $p\land(q\land r)$

9. Which of the following statement is a tautology
   a) $(\sim q\land p)\land q$          b) $(\sim q\land p)\land(p\land\sim p)$          c) $(\sim q\land p)\lor(p\land\sim p)$          d) $(p\land q)\land(\sim(p\land q))$
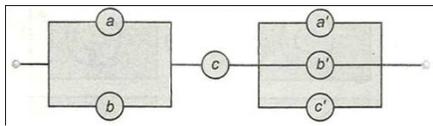
10. The negation of the proposition "If 2 is prime, then 3 is odd" is
    a) If 2 is not prime, then 3 is not odd          b) 2 is prime and 3 is not odd
    c) 2 is not prime and 3 is odd          d) If 2 is not prime, then 3 is odd

11. If $p, q,$ and $r$ are simple propositions with truth values T,F,T, then the truth value of $(\sim p\lor q)\land\land\sim q\to p$ is
    a) True          b) False          c) True, if $r$ is false          d) None of these

12. Switching function of the network is



   a) $(a\land b)\lor c\lor(a'\land b'\land c')$          b) $(a\land b)\lor c\lor(a'\land b'\land c)$
   c) $(a\lor b)\land c\land(a'\lor b'\lor c')$          d) None of the above

13. The negation of the proposition $q\lor\sim(p\land r)$ is
    a) $\sim q\lor(p\land r)$          b) $\sim q\land(p\land r)$          c) $\sim p\lor\sim q\lor\sim r$          d) None of these

14. Which of the following pairs are logically equivalent?
    a) Conditional, Contrapositive
    b) Conditional, Inverse
    c) Contrapositive, Converse
    d) Inverse, Contrapositive

15. The statement $(\sim p\land q)\lor\sim q$ is
    a) $p\lor q$          b) $p\land q$          c) $\sim(p\lor q)$          d) $\sim(p\land q)$

16. $\sim[(p\land q)\to(\sim p\lor q)]$ is
    a) Tautology          b) Contradiction          c) neither (a) nor (b)          d) either (a) or (b)

17. If $p\to(q\lor r)$ is false, then the truth values of $p,\ q,\ r$ are respectively
    a) F, T, T          b) T, T, F          c) T, F, F          d) F, F, F

18. Let $R$ be the set of real numbers and $x\in R$. Then, $x+3=8$ is
    a) Open statement          b) A true statement          c) False statement          d) None of these

19. Which of the following not a statement in logic?
1. Earth is planet.
2. Plants are living objects.

3. $\sqrt{-3}$ is a rational number.

4. $x^2 - 5x + 6 < 0$, when $x \in -R$.

    a) 1                       b) 3                      c) 2                      d) 4

20. Dual of $(x \wedge y) \vee (x \wedge 1) = x \wedge x \vee y \wedge y$ is

    a) $(x \vee y) \wedge (x \vee 0) = x \vee (x \wedge y) \vee y$             b) $(x \wedge y) \wedge (x \vee 1) = x \vee (x \wedge y) \vee y$

    c) $(x \vee y) \vee (x \vee 0) = x \vee (x \wedge y) \vee y$             d) None of the above