Note:-
 1. All Questions are compulsory.
 2. Numbers on the right indicate full marks.

Section A

Q.1 Select and write the correct answer. **(4)**

  1. The negation of inverse of $\sim p \rightarrow q$ is _____

   A) $q \wedge p$ B) $\sim p \wedge \sim q$

   C) $p \wedge q$ D) $\sim q \rightarrow \sim p$

  2. Inverse of statement pattern $(p \vee q) \rightarrow (p \wedge q)$ is _____

   A) $(p \wedge q) \rightarrow (p \vee q)$ B) $\sim (p \vee q) \rightarrow (p \wedge q)$

   C) $(\sim p \wedge \sim q) \rightarrow (\sim p \vee \sim q)$ D) $(\sim p \vee \sim q) \rightarrow (\sim p \wedge \sim q)$

Q.2 Answer the following.

(3)

  1. Write the truth value of the square of any even number is odd or the cube of any odd number is odd.

  2. $\exists x \in N$ such that $x - 17 < 20$ Write the negation.

  3. Using the rules in logic, write the negation of $p \wedge (q \vee r)$

Section B
Attempt any Four

Q.3   Write the truth value of 5 is a prime number and 7 divides 94 **(2)**

Q.4   If the statement p, q are true statement and r, s are false statement then determine the truth value of the $(\sim r \leftrightarrow p) \rightarrow \sim q$ **(2)**

Q.5   If the statement p, q are true statement and r, s are false statement then determine the truth value of the $\sim[(\sim p \wedge r) \vee (s \rightarrow \sim q)] \leftrightarrow (p \wedge r)$ **(2)**

Q.6   If it is raining then we will go and play football.Write the negation. **(2)**

Q.7   Using truth table prove the $p \rightarrow (q \rightarrow p) \equiv \sim p \rightarrow (p \rightarrow q)$ logical equivalence. **(2)**

Q.8   If the statement p, q are true statement and r, s are false statement then determine the truth value of the $[(\sim p \wedge q) \wedge \sim r] \vee [(q \rightarrow p) \rightarrow (\sim s \vee r)]$ **(2)**

Section C
Attempt any Two

Q.9   Construct the truth table for $p \rightarrow [\sim (q \wedge r)]$ **(3)**

Q.10   Using truth table prove the $[\sim(p \vee q) \vee (p \vee q)] \wedge r \equiv r$ logical equivalence. **(3)**

Q.11   Determine the truth value of p and q in the $(p \wedge q)$ is F and $(p \wedge q) \rightarrow q$ is T **(3)**

Section D
Attempt any One

Q.12   Determine whether the [p → (q → r)] ↔ [(p ∧ q) → r] statement pattern are tautology, **(4)** contradictions or contingency.

Q.13   Simplify the following so that the new circuit has minimum number of switche. Also, draw the **(4)** simplified circuit.