FOUNDATION

MHT-CET MATHEMATICS

From vision to victory

Includes **Authentic Questions** from Latest MHT-CET Examination

- Based on Latest Paper Pattern
- Quick Review
- Previous Years' Questions

Std. XII

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XII

Foundation

MHT-CET MATHEMATICS

MULTIPLE CHOICE QUESTIONS

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Chapter

1

Mathematical Logic

Quick Review

- **Statement**

  A statement is declarative sentence which is either true or false, but not both simultaneously.
- Statements are denoted by lower case letters p, q, r, etc.
- The truth value of a statement is denoted by '1' or 'T' for True and '0' or 'F' for False.

  Open sentences, imperative sentences, exclamatory sentences and interrogative sentences **are not considered as Statements** in Logic.

- **Logical connectives**

Type of compound statement	Connective	Symbol	Example
Conjuction	and	$\wedge$	p and q : $p \wedge q$
Disjunction	or	$\vee$	p or q : $p \vee q$
Negation	not	$\sim$	negation p : $\sim p$ not p : $\sim p$
Conditional or Implication	if….then	$\rightarrow$ or $\Rightarrow$	If p, then q : $p \rightarrow q$
Biconditional or Double implication	if and only if, i.e., iff	$\leftrightarrow$ or $\Leftrightarrow$	p iff q : $p \leftrightarrow q$

- When two or more simple statements are combined using logical connectives, then the statement so formed is called **Compound Statement**.
- Sub-statements are those simple statements which are used in a compound statement.
- In the conditional statement $p \rightarrow q$, p is called the antecedent or hypothesis, while q is called the consequent or conclusion.

- **Truth Tables for compound statements:**
- Conjuction, Disjunction, Conditional and Biconditional:

p	q	$p \wedge q$	$p \vee q$	$p \rightarrow q$	$p \leftrightarrow q$
T	T	T	T	T	T
T	F	F	T	F	F
F	T	F	T	T	F
F	F	F	F	T	T

- Negation:

p	$\sim p$
T	F
F	T

- **Relation between compound statements and sets in set theory:**

Logic	Set Theory
Negation	complement of a set
Disjunction	union of two sets
Conjunction	intersection of two sets
Conditional	subset of a set
Biconditional	equality of two sets

- **Statement Pattern:**

  When two or more simple statements p, q, r …. are combined using connectives $\wedge$, $\vee$, $\sim$, $\rightarrow$, $\leftrightarrow$ the new statement formed is called a **statement pattern.**

  e.g.: $\sim p \wedge q$, $p \wedge (p \wedge q)$, $(q \rightarrow p) \vee r$

➢ **Converse, Inverse, Contrapositive of a Statement:**

Conditional Statement	Converse	Inverse	Contrapositive
$p \to q$	$q \to p$	$\sim p \to \sim q$	$\sim q \to \sim p$

➢ **Logical equivalence:**

If two statement patterns have the same truth values in their respective columns of their joint truth table, then these two statement patterns are **logically equivalent.**

Consider the truth table:

p	q	~p	~q	$p \to q$	$q \to p$	$\sim p \to \sim q$	$\sim q \to \sim p$
T	T	F	F	T	T	T	T
T	F	F	T	F	T	T	F
F	T	T	F	T	F	F	T
F	F	T	T	T	T	T	T

From the given truth table, we can summarize the following:

- The given statement and its contrapositive are logically equivalent.
  i.e., $p \to q \equiv \sim q \to \sim p$
- The converse and inverse of the given statement are logically equivalent.
  i.e., $q \to p \equiv \sim p \to \sim q$

➢ **Algebra of statements:**

Idempotent Law	$p \vee p \equiv p$ $p \wedge p \equiv p$	**Identity Law**	$p \wedge T \equiv p$ $p \wedge F \equiv F$ $p \vee F \equiv p$ $p \vee T \equiv T$
Commutative Law	$p \vee q \equiv q \vee p$ $p \wedge q \equiv q \wedge p$	**Complement Law**	$p \wedge \sim p \equiv F$ $p \vee \sim p \equiv T$
Associative Law	$(p \vee q) \vee r \equiv p \vee (q \vee r)$ $\equiv p \vee q \vee r$	**Absorption Law**	$p \vee (p \wedge q) \equiv p$ $p \wedge (p \vee q) \equiv p$
	$(p \wedge q) \wedge r \equiv p \wedge (q \wedge r)$ $\equiv p \wedge q \wedge r$	**Conditional Law**	$p \to q \equiv \sim p \vee q$
Distributive Law	$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$ $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$	**Biconditional Law**	$p \leftrightarrow q \equiv (p \to q) \wedge (q \to p)$ $\equiv (\sim p \vee q) \wedge (\sim q \vee p)$
De Morgan's Law	$\sim(p \vee q) \equiv \sim p \wedge \sim q$ $\sim(p \vee q) \equiv \sim p \wedge \sim q$		

➢ **Types of Statements:**

- If a statement is **always true**, then the statement is called a "**tautology**".
- If a statement is **always false**, then the statement is called a "**contradiction**" or a "**fallacy**".
- If a statement is **neither a tautology nor a contradiction,** then it is called "**contingency**".

➢ **Quantifiers and Quantified Statements:**

Quantifier Symbol	stands for	known as
$\forall$	"all values of " or "for every"	Universal Quantifier
$\exists$	"there exists atleast one"	Existential Quantifier

When a quantifier is used in an open sentence, it becomes a statement and is called a **Quantified Statement.**

➢ **Principles of Duality:**

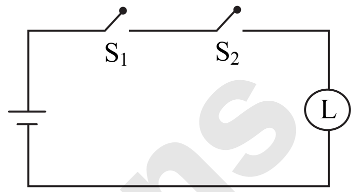
Two compound statements are said to be dual of each other, if one can be obtained from the other by replacing "$\wedge$" by "$\vee$" and vice versa. The connectives "$\wedge$" and "$\vee$" are duals of each other. If 't' is tautology and 'c' is contradiction, then the special statements 't' & 'c' are duals of each other.

➢ **Negation of a Statement:**

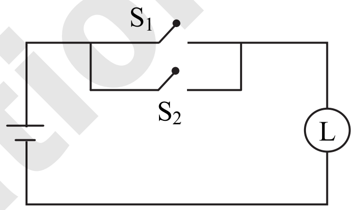
• $\sim(p \vee q) \equiv \sim p \wedge \sim q$	• $\sim(p \wedge q) \equiv \sim p \vee \sim q$	• $\sim(p \rightarrow q) \equiv p \wedge \sim q$
• $\sim(p \leftrightarrow q) \equiv (p \wedge \sim q) \vee (q \wedge \sim p)$	• $\sim(\sim p) \equiv p$	• $\sim(\exists\, x) \equiv \forall\, x$
• $\sim(\forall\, x) \equiv \exists\, x$	• $\sim(x < y) \equiv x \geq y$	• $\sim(x > y) \equiv x \leq y$

➢ **Application of Logic to Switching Circuits:**

- **AND : [$\wedge$] (Switches in series)**
  Let p : S_1 switch is ON
  q : S_2 switch is ON
  For the lamp L to be 'ON' both S_1 and S_2 must be ON
  Using theory of logic, the adjacent circuit can be expressed as, $\mathbf{p \wedge q}$.



- **OR : [$\vee$] (Switches in parallel)**
  Let p : S_1 switch is ON
  q : S_2 switch is ON
  For lamp L to be put ON either one of the two switches S_1 and S_2 must be ON.
  Using theory of logic, the adjacent circuit can be expressed as $\mathbf{p \vee q}$.



- If two or more switches open or close simultaneously then the switches are denoted by the same letter.
  If p : switch S is closed.
  $\sim$ p : switch S is open.
  If S_1 and S_2 are two switches such that if S_1 is open S_2 is closed and vice versa,
  then $S_1 \equiv \sim S_2$ or $S_2 \equiv \sim S_1$

Classical Thinking

1.1 Statement, Logical Connectives, Compound Statements and Truth Table

1. Which of the following is a statement in logic?
(A) Go away
(B) How beautiful!
(C) $x > 5$
(D) 2 = 3

2. Which of the following is a statement in logic?
(A) What a wonderful day!
(B) Shut up!
(C) What are you doing?
(D) Bombay is the capital of India.

3. p : There are clouds in the sky and q : it is not raining. The symbolic form is
(A) $p \rightarrow q$ (B) $p \rightarrow \sim q$
(C) $p \wedge \sim q$ (D) $\sim p \wedge q$

4. If p: The sun has set, q: The moon has risen, then symbolically the statement 'The sun has not set or the moon has not risen' is written as
(A) $p \wedge \sim q$ (B) $\sim q \vee p$
(C) $\sim p \wedge q$ (D) $\sim p \vee \sim q$

5. If p: Rohit is tall, q: Rohit is handsome, then the statement 'Rohit is tall or he is short and handsome' can be written symbolically as
(A) $p \vee (\sim p \wedge q)$ (B) $p \wedge (\sim p \vee q)$
(C) $p \vee (p \wedge \sim q)$ (D) $\sim p \wedge (\sim p \wedge \sim q)$

6. Assuming the first part of the statement as p, second as q and the third as r, the statement 'Candidates are present, and voters are ready to vote but no ballot papers' in symbolic form is
(A) $(p \vee q) \wedge \sim r$ (B) $(p \wedge \sim q) \wedge r$
(C) $(\sim p \wedge q) \wedge \sim r$ (D) $(p \wedge q) \wedge \sim r$

7. Let p be the proposition : Mathematics is interesting and let q be the proposition : 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 interesting and Mathematics is difficult.
(D) Mathematics is interesting or Mathematics is difficult.

8. Write verbally $\sim p \vee q$ where
p: She is beautiful; q: She is clever
(A) She is beautiful but not clever
(B) She is not beautiful or she is clever
(C) She is not beautiful or she is not clever
(D) She is beautiful and clever.

9. If p: Ram is lazy, q: Ram fails in the examination, then the verbal form of $\sim p \vee \sim q$ is
(A) Ram is not lazy and he fails in the examination.
(B) Ram is not lazy or he does not fail in the examination.
(C) Ram is lazy or he does not fail in the examination.
(D) Ram is not lazy and he does not fail in the examination.

10. A compound statement p or q is false only when
(A) p is false.
(B) q is false.
(C) both p and q are false.
(D) depends on p and q.

11. A compound statement p and q is true only when
(A) p is true.
(B) q is true.
(C) both p and q are true.
(D) none of p and q is true.

12. For the statements p and q '$p \to q$' is read as 'if p then q'. Here, the statement q is called
(A) antecedent.
(B) consequent.
(C) logical connective.
(D) prime component.

13. If p : Prakash passes the exam,
q : Papa will give him a bicycle.
Then the statement 'Prakash passing the exam, implies that his papa will give him a bicycle' can be symbolically written as
(A) $p \to q$ (B) $p \leftrightarrow q$
(C) $p \wedge q$ (D) $p \vee q$

14. If d: driver is drunk, a: driver meets with an accident, translate the statement 'If the Driver is not drunk, then he cannot meet with an accident' into symbols
(A) $\sim a \to \sim d$ (B) $\sim d \to \sim a$
(C) $\sim d \wedge a$ (D) $a \wedge \sim d$

15. If a: Vijay becomes a doctor,
b: Ajay is an engineer.
Then the statement 'Vijay becomes a doctor if and only if Ajay is an engineer' can be written in symbolic form as
(A) $b \leftrightarrow \sim a$ (B) $a \leftrightarrow b$
(C) $a \to b$ (D) $b \to a$

16. A compound statement $p \to q$ is false only when
(A) p is true and q is false.
(B) p is false but q is true.
(C) atleast one of p or q is false.
(D) both p and q are false.

17. Assuming the first part of each statement as p, second as q and the third as r, the statement 'If A, B, C are three distinct points, then either they are collinear or they form a triangle' in symbolic form is
(A) $p \leftrightarrow (q \vee r)$ (B) $(p \wedge q) \to r$
(C) $p \to (q \vee r)$ (D) $p \to (q \wedge r)$

18. If m: Rimi likes calculus.
n: Rimi opts for engineering branch.
Then the verbal form of $m \to n$ is
(A) If Rimi opts for engineering branch then she likes calculus.
(B) If Rimi likes calculus then she does not opt for engineering branch.
(C) If Rimi likes calculus then she opts for engineering branch
(D) If Rimi likes engineering branch then she opts for calculus.

19. The statement "If x^2 is not even then x is not even", is the converse of the statement
(A) If x^2 is odd, then x is even
(B) If x is not even, then x^2 is not even
(C) If x is even, then x^2 is even
(D) If x is odd, then x^2 is even

20. The converse of the statement "If $x > y$, then $x + a > y + a$", is
(A) If $x < y$, then $x + a < y + a$
(B) If $x + a > y + a$, then $x > y$
(C) If $x < y$, then $x + a > y + a$
(D) If $x > y$, then $x + a < y + a$

21. If Ram secures 100 marks in maths, then he will get a mobile. The converse is
(A) If Ram gets a mobile, then he will not secure 100 marks in maths.
(B) If Ram does not get a mobile, then he will secure 100 marks in maths.
(C) If Ram will get a mobile, then he secures 100 marks in maths.
(D) None of these

22. The inverse of the statement "If you access the internet, then you have to pay the charges", is
(A) If you do not access the internet, then you do not have to pay the charges.
(B) If you pay the charges, then you accessed the internet.
(C) If you do not pay the charges, then you do not access the internet.
(D) You have to pay the charges if and only if you access the internet.

23. The contrapositive of the statement: "If a child concentrates then he learns" is
(A) If a child does not concentrate he does not learn.
(B) If a child does not learn then he does not concentrate.
(C) If a child practises then he learns.
(D) If a child concentrates, he does not forget.

24. If p: Sita gets promotion,
q: Sita is transferred to Pune.
The verbal form of $\sim p \leftrightarrow q$ is written as
(A) Sita gets promotion and Sita gets transferred to Pune.
(B) Sita does not get promotion then Sita will be transferred to Pune.
(C) Sita gets promotion if Sita is transferred to Pune.
(D) Sita does not get promotion if and only if Sita is transferred to Pune.

25. Negation of a statement in logic corresponds to _______ in set theory.
(A) empty set
(B) null set
(C) complement of a set
(D) universal set

26. The logical statement '$p \wedge q$' can be related to the set theory's concept of
(A) union of two sets
(B) intersection of two set
(C) subset of a set
(D) equality of two sets

27. If p and q are two logical statements and A and B are two sets, then $p \to q$ corresponds to
(A) $A \subseteq B$ (B) $A \cap B$
(C) $A \cup B$ (D) $A \not\subseteq B$

1.2 Statement Pattern, Logical Equivalence, and Algebra of Statements

1. The statement $p \to (\sim q)$ is equivalent to
(A) $q \to p$ (B) $\sim q \vee \sim p$
(C) $p \wedge \sim q$ (D) $\sim q \to p$

2. Every conditional statement is equivalent to
(A) its contrapositive (B) its inverse
(C) its converse (D) only itself

3. The logically equivalent statement of $p \leftrightarrow q$ is
(A) $(p \wedge q) \vee (q \to p)$
(B) $(p \wedge q) \to (p \vee q)$
(C) $(p \to q) \wedge (q \to p)$
(D) $(p \wedge q) \vee (p \wedge q)$

4. The statement, 'If it is raining then I will go to college' is equivalent to
(A) If it is not raining then I will not go to college.
(B) If I do not go to college, then it is not raining.
(C) If I go to college then it is raining.
(D) Going to college depends on my mood.

5. The logically equivalent statement of $(p \wedge q) \vee (p \wedge r)$ is
(A) $p \vee (q \wedge r)$ (B) $q \vee (p \wedge r)$
(C) $p \wedge (q \vee r)$ (D) $q \wedge (p \vee r)$

6. The Boolean Expression $(p \wedge \sim q) \vee q \vee (\sim p \wedge q)$ is equivalent to:
(A) $p \wedge q$ (B) $p \vee q$
(C) $p \vee \sim q$ (D) $\sim p \wedge q$

1.3 Tautology, Contradiction, Contingency

1. $(p \wedge \sim q) \wedge (\sim p \wedge q)$ is a
(A) Tautology
(B) Contradiction
(C) Tautology and contradiction
(D) Contingency

2. When the compound statement is true for all its components then the statement is called
(A) negation statement.
(B) tautology statement.
(C) contradiction statement.
(D) contingency statement.

3. The statement $(p \wedge q) \to p$ is
(A) a contradiction (B) a tautology
(C) either (A) or (B) (D) a contingency

4. The proposition $(p \wedge q) \wedge (p \to \sim q)$ is
(A) Contradiction
(B) Tautology
(C) Contingency
(D) Tautology and Contradiction

5. The proposition $(p \to \sim p) \wedge (\sim p \to p)$ is a
(A) Neither tautology nor contradiction
(B) Tautology
(C) Tautology and contradiction
(D) Contradiction

6. The proposition $p \to \sim(p \wedge \sim q)$ is a
(A) contradiction.
(B) tautology.
(C) contingency.
(D) none of these

7. Which of the following statements is a tautology?

(A) $(\sim q \wedge p) \wedge q$
(B) $(\sim q \wedge p) \wedge (p \wedge \sim p)$
(C) $(\sim q \wedge p) \vee (p \vee \sim p)$
(D) $(p \wedge q) \wedge (\sim(p \wedge q))$

1.4 Quantifiers and Quantified Statements, Duality

1. Using quantifier the open sentence '$x^2 - 4 = 32$' defined on W is converted into true statement as

(A) $\forall x \in W, x^2 - 4 = 32$
(B) $\exists x \in W$, such that $x^2 - 4 \le 32$
(C) $\forall x \in W, x^2 - 4 > 32$
(D) $\exists x \in W$, such that $x^2 - 4 = 32$

2. Using quantifiers $\forall, \exists$, convert the following open statement into true statement.
'$x + 5 = 8, x \in N$'

(A) $\forall x \in N, x + 5 = 8$
(B) For every $x \in N, x + 5 > 8$
(C) $\exists x \in N$, such that $x + 5 = 8$
(D) For every $x \in N, x + 5 < 8$

3. The dual of the statement "Manoj has the job but he is not happy" is

(A) Manoj has the job or he is not happy.
(B) Manoj has the job and he is not happy.
(C) Manoj has the job and he is happy.
(D) Manoj does not have the job and he is happy.

4. Dual of the statement $(p \wedge q) \vee \sim q \equiv p \vee \sim q$ is

(A) $(p \vee q) \vee \sim q \equiv p \vee \sim q$
(B) $(p \wedge q) \wedge \sim q \equiv p \wedge \sim q$
(C) $(p \vee q) \wedge \sim q \equiv p \wedge \sim q$
(D) $(\sim p \vee \sim q) \wedge q \equiv \sim p \wedge q$

1.5 Negation of compound statements

1. The negation of $(p \vee \sim q) \wedge q$ is

(A) $(\sim p \vee q) \wedge \sim q$ (B) $(p \wedge \sim q) \vee q$
(C) $(\sim p \wedge q) \vee \sim q$ (D) $(p \wedge \sim q) \vee \sim q$

2. The negation of the statement
" I like Mathematics and English" is

(A) I do not like Mathematics and do not like English
(B) I like Mathematics but do not like English
(C) I do not like Mathematics but like English
(D) Either I do not like Mathematics or do not like English

3. Negation of the statement: '$\sqrt{5}$ is an integer or 5 is irrational' is

(A) $\sqrt{5}$ is not an integer or 5 is not irrational
(B) $\sqrt{5}$ is irrational or 5 is an integer
(C) $\sqrt{5}$ is an integer and 5 is irrational
(D) $\sqrt{5}$ is not an integer and 5 is not irrational

4. $\sim(p \leftrightarrow q)$ is equivalent to

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

5. The negation of 'If it is Sunday then it is a holiday' is

(A) It is a holiday but not a Sunday.
(B) No Sunday then no holiday.
(C) It is Sunday, but it is not a holiday,
(D) No holiday therefore no Sunday.

6. The negation of $q \vee \sim(p \wedge r)$ is

(A) $\sim q \wedge \sim(p \vee r)$
(B) $\sim q \wedge (p \wedge r)$
(C) $\sim q \vee (p \wedge r)$
(D) $\sim q \vee (p \wedge r)$

7. Which of the following is always true?

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

8. The negation of 'For every natural number x, $x + 5 > 4$' is

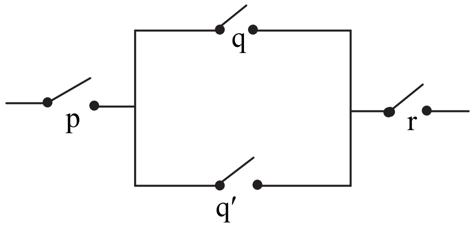
(A) $\forall x \in N, x + 5 < 4$
(B) $\forall x \in N, x - 5 < 4$
(C) For every integer x, $x + 5 < 4$
(D) There exists a natural number x, for which $x + 5 \le 4$

9. The negation of the statement "All continuous functions are differentiable"

(A) Some continuous functions are differentiable
(B) All differentiable functions are continuous
(C) All continuous functions are not differentiable
(D) Some continuous functions are not differentiable

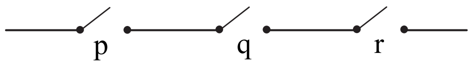
1.6 Switching circuit

1. When does the current flow through the following circuit.



(A) p, q should be closed and r is open
(B) p, q, r should be open
(C) p, q, r should be closed
(D) none of these

2. The switching circuit for the statement $p \wedge q \wedge r$ is

(A)


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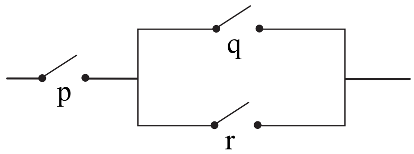

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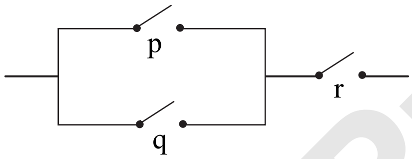
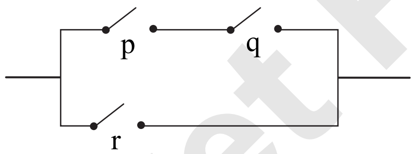
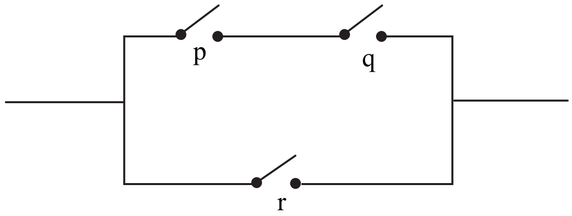


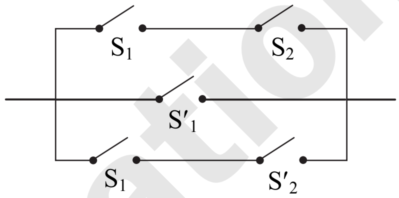
(D)


3. If the current flows through the given circuit, then it is expressed symbolically as,



(A) $(p \wedge q) \vee r$
(B) $(p \wedge q)$
(C) $(p \vee q)$
(D) $(p \vee q) \wedge r$

4. The switching circuit

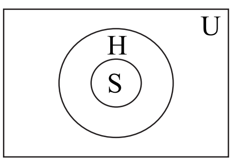


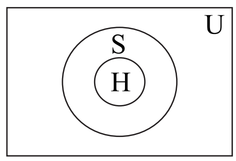
in symbolic form of logic, is
(A) $(p \wedge q) \vee (\sim p) \vee (p \wedge \sim q)$
(B) $(p \vee q) \vee (\sim p) \vee (p \wedge \sim q)$
(C) $(p \wedge q) \wedge (\sim p) \vee (p \wedge \sim q)$
(D) $(p \vee q) \wedge (\sim p) \vee (p \wedge \sim q)$

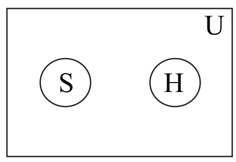
MHT-CET Previous Years' Questions

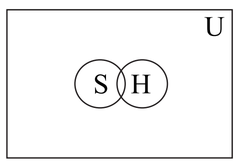
1. p : A man is happy
q : The man is rich.
The symbolic representation of "If a man is not rich then he is not happy" is **[2004]**
(A) $\sim p \to \sim q$ (B) $\sim q \to \sim p$
(C) $p \to q$ (D) $p \to \sim q$

2. If U: Set of all days,
S: Set of Sundays,
H: Set of holidays, then,
Venn diagram for "Sunday implies holiday" is **[2004]**

(A)


(B)


(C)


(D)


3. Which of the following statement is not a statement in logic? **[2005]**
(A) Earth is a planet.
(B) Plants are living object.
(C) $\sqrt{-9}$ is a rational number.
(D) I am lying.

4. Negation of $(p \wedge q) \rightarrow (\sim p \vee r)$ is **[2005]**
(A) $(p \vee q) \wedge (p \wedge \sim r)$
(B) $(p \wedge q) \vee (p \wedge \sim r)$
(C) $(p \wedge q) \wedge (p \wedge \sim r)$
(D) $(p \vee q) \vee (p \wedge \sim r)$

5. Negation of $p \leftrightarrow q$ is **[2005]**
(A) $(p \wedge q) \vee (p \wedge q)$
(B) $(p \wedge \sim q) \vee (q \wedge \sim p)$
(C) $(\sim p \wedge q) \vee (q \wedge p)$
(D) $(p \wedge q) \vee (\sim q \wedge p)$

6. Negation of the statement 'A is rich but silly' is **[2006]**
(A) Either A is not rich or not silly.
(B) A is poor or clever.
(C) A is rich or not silly.
(D) A is either rich or silly.

7. The negation of the statement given by "He is rich and happy" is **[2006]**
(A) He is not rich and not happy
(B) He is rich but not happy
(C) He is not rich but happy
(D) Either he is not rich or he is not happy

8. If p : $x > y$; q > z; r : $x > z$, then which of the options represents 'If $x > y$ and $y > z$, then $x > z$'? **[2006]**
(A) $(p \vee q) \rightarrow r$ (B) $(p \vee q) \rightarrow \sim q$
(C) $(p \wedge \sim q) \rightarrow q$ (D) $(\sim p \wedge q) \wedge q$

9. If p and q are true statements in logic, which of the following statement pattern is true? **[2007]**
(A) $(p \vee q) \wedge \sim q$ (B) $(p \vee q) \rightarrow \sim q$
(C) $(p \wedge \sim q) \rightarrow q$ (D) $(\sim p \wedge q) \wedge q$

10. $\sim(\sim p \wedge \sim q)$ is equivalent to **[2007]**
(A) $p \wedge q$ (B) $p \rightarrow q$
(C) $p \vee q$ (D) $p \leftrightarrow q$

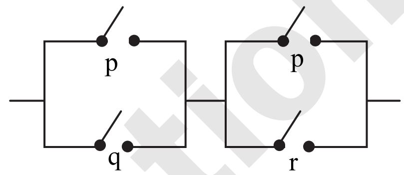
11. $(p \rightarrow \sim p) \vee (\sim p \rightarrow p)$ is equivalent to **[2008]**
(A) $T \rightarrow F$ (B) $p \wedge \sim p$
(C) $T \vee p$ (D) $T \leftrightarrow F$

12. p: Ram is rich
q: Ram is successful
r: Ram is talented
Write the symbolic form of the given statement.
Ram is neither rich nor successful and he is not talented **[2008]**
(A) $\sim p \wedge \sim q \vee \sim r$ (B) $\sim p \vee \sim q \wedge \sim r$
(C) $\sim p \vee \sim q \vee \sim r$ (D) $\sim p \wedge \sim q \wedge \sim r$

13. $(p \wedge q) \vee (\sim q \wedge p) \equiv$ **[2009]**
(A) $q \vee p$ (B) p
(C) $\sim q$ (D) $p \wedge q$

14. Negation of $(\sim p \rightarrow q)$ is **[2009]**
(A) $\sim p \vee \sim q$ (B) $\sim p \wedge \sim q$
(C) $p \wedge \sim q$ (D) $\sim p \vee q$

15. If

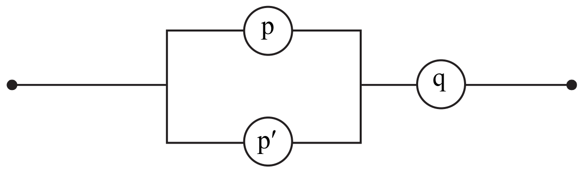


then the symbolic form is **[2009]**
(A) $(p \vee q) \wedge (p \vee r)$
(B) $(p \wedge q) \vee (p \vee r)$
(C) $(p \wedge q) \wedge (p \wedge r)$
(D) $(p \wedge q) \wedge r$

16. If $(p \wedge \sim q) \rightarrow (\sim p \vee r)$ is a false statement, then respective truth values of p, q and r are **[2010]**
(A) T, F, F (B) F, T, T
(C) T, T, T (D) F, F, F

17. Negation of the statement $p \rightarrow q$ is **[2010]**
(A) $\sim p \vee q$ (B) $\sim p \vee \sim q$
(C) $p \wedge \sim q$ (D) $p \wedge q$

18. Simplified logical expression for the following switching circuit is



[2010]
(A) p (B) q
(C) p′ (D) $p \wedge q$

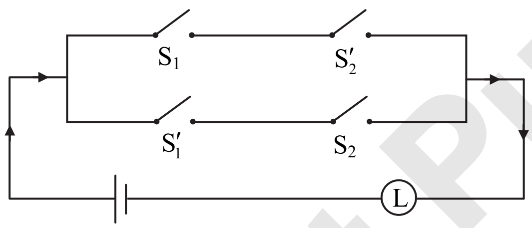
19. Let p : Boys are playing
q : Boys are happy
the equivalent form of compound statement $\sim p \vee q$ is **[2013]**
(A) Boys are not playing or they are happy.
(B) Boys are not happy or they are playing.
(C) Boys are playing or they are not happy.
(D) Boys are not playing or they are not happy.

20. Let p : A triangle is equilateral, q : A triangle is equiangular, then inverse of $q \rightarrow p$ is **[2013]**
(A) If a triangle is not equilateral then it is not equiangular.
(B) If a triangle is not equiangular then it is not equilateral.
(C) If a triangle is equiangular then it is not equilateral.
(D) If a triangle is equiangular then it is equilateral.

21. If p : Every square is a rectangle
q : Every rhombus is a kite then truth values of $p \rightarrow q$ and $p \leftrightarrow q$ are _______ and _______ respectively. **[2016]**
(A) F, F (B) T, F
(C) F, T (D) T, T

22. Which of the following quantified statement is true ? **[2016]**
(A) The square of every real number is positive
(B) There exists a real number whose square is negative
(C) There exists a real number whose square is not positive
(D) Every real number is rational

23.



Symbolic form of the given switching circuit is equivalent to ________ **[2016]**
(A) $p \vee \sim q$ (B) $p \wedge \sim q$
(C) $p \leftrightarrow q$ (D) $\sim(p \leftrightarrow q)$

24. The statement pattern $(\sim p \wedge q)$ is logically equivalent to **[2017]**
(A) $(p \vee q) \vee \sim p$ (B) $(p \vee q) \wedge \sim p$
(C) $(p \wedge q) \rightarrow p$ (D) $(p \vee q) \rightarrow p$

25. Which of the following statement pattern is a tautology? **[2017]**
(A) $p \vee (q \rightarrow p)$
(B) $\sim q \rightarrow \sim p$
(C) $(q \rightarrow p) \vee (\sim p \leftrightarrow q)$
(D) $p \wedge \sim p$

26. If c denotes the contradiction then dual of the compound statement $\sim p \wedge (q \vee c)$ is **[2017]**
(A) $\sim p \vee (q \wedge t)$ (B) $\sim p \wedge (q \vee t)$
(C) $p \vee (\sim q \vee t)$ (D) $\sim p \vee (q \wedge c)$

27. The contrapositive of the statement: "If the weather is fine then my friends will come and we go for a picnic." is **[2018]**
(A) The weather is fine but my friends will not come or we do not go for a picnic.
(B) If my friends do not come or we do not go for a picnic then weather will not be fine.
(C) If the weather is not fine then my friends will not come or we do not go for a picnic.
(D) The weather is not fine but my friends will come and we go for a picnic.

28. The statement pattern $p \wedge (\sim p \wedge q)$ is **[2018]**
(A) a tautology
(B) a contradiction
(C) equivalent to $p \wedge q$
(D) equivalent to $p \vee q$

29. The negation of the statement: "Getting above 95% marks is necessary condition for Hema to get admission in good college" is **[2018]**
(A) Hema gets above 95% marks but she does not get admission in good college.
(B) Hema does not get above 95% marks and she gets admission in good college.
(C) If Hema does not get above 95% marks then she will not get admission in good college.
(D) Hema does not get above 95% marks or she gets admission in good college.

30. If p: Rahul is physically disable. q: Rahul stood first in the class, then the statement "In spite of physical disability Rahul stood first in the class in symbolic form is **[2019]**
(A) $p \wedge q$ (B) $p \vee q$
(C) $\sim p \vee q$ (D) $p \rightarrow q$

31. If truth values of p, $p \leftrightarrow r$, $p \leftrightarrow q$ are F, T, F respectively, then respective truth values of q and r are **[2019]**
(A) F, T (B) T, T
(C) F, F (D) T, F

32. The negation of the statement "some equations have real roots" is **[2019]**
(A) All equations do not have real roots
(B) All equations have real roots
(C) Some equations do not have real roots
(D) Some equations have rational roots

33. The equivalent form of the statement $\sim(p \rightarrow \sim q)$ is **[2019]**
(A) $\sim p \vee q$ (B) $p \wedge q$
(C) $p \wedge \sim q$ (D) $p \vee \sim q$

34. The statement pattern
$(p \wedge q) \wedge [\sim r \vee (p \wedge q)] \vee (\sim p \wedge q)$ is equivalent to **[2019]**
(A) r (B) $p \wedge q$
(C) p (D) q

35. Which of the following is NOT equivalent to $p \rightarrow q$. **[2019]**
(A) p is sufficient for q
(B) p only if q
(C) q is necessary for p
(D) q only if p

36. Let a : $\sim(p \wedge \sim r) \vee (\sim q \vee s)$ and
b : $(p \vee s) \leftrightarrow (q \wedge r)$.
If the truth values of p and q are true and that of r and s are false, then the truth values of a and b are respectively. **[2019]**
(A) F, F (B) T, T
(C) T, F (D) F, T

37. $p \leftrightarrow q$ is logically NOT equivalent to **[2019]**
(A) $(\sim p \vee q) \wedge (\sim q \vee p)$
(B) $(p \wedge q) \vee (\sim p \wedge \sim q)$
(C) $(p \wedge \sim q) \vee (q \wedge \sim p)$
(D) $(p \rightarrow q) \wedge (q \rightarrow p)$

38. Let p : I is cloudly, q : It is still raining. The symbolic form of "Even though it is not cloudy, it is still raining" is **[2019]**
(A) $\sim p \wedge q$ (B) $p \wedge \sim q$
(C) $\sim p \wedge \sim q$ (D) $\sim p \vee q$

39. Dual of the statement $(p \rightarrow q) \rightarrow r$ is **[2019]**
(A) $(p \vee \sim q) \vee r$ (B) $(p \rightarrow q) \vee r$
(C) $(q \rightarrow p) \wedge r$ (D) $p \rightarrow (q \rightarrow r)$

40. The contrapositive of "If f(2) = 0, then polynomial f(x) is divisible by (x – 2)" is **[2019]**
(A) If f(2) $\neq$ 0 then polynomial f(x) is not divisible by (x – 2)
(B) If polynomial f(x) is not divisible by (x – 2), then f(2) $\neq$ 0
(C) If polynomial f(x) is divisible by (x – 2), then f(2) = 0
(D) Polynomial f(x) is divisible by (x – 2) only if f(2) $\neq$ 0

41. Let p : $\exists\, n \in N$ such that $n + 5 > 10$
q : $\forall\, n \in N$, $n^2 + n$ is an even number while $n^2 - n$ is an odd number.
The Truth values of p and q are respectively. **[2019]**
(A) T, F (B) T, T
(C) F, T (D) F, F

42. Which of the following statement pattern is a tautology?
$S_1 \equiv \sim p \rightarrow (q \leftrightarrow p)$,
$S_2 \equiv \sim p \vee \sim q$
$S_3 \equiv (p \rightarrow q) \wedge (q \rightarrow p)$,
$S_4 \equiv (p \rightarrow q) \vee (\sim p \leftrightarrow q)$
[2020]
(A) S_2 (B) S_3
(C) S_1 (D) S_4

43. The negation of the statement 'If 5 < 7 and 7 > 2, then 5 > 2' is **[2020]**
(A) 5 < 7 and 7 > 2 or 5 < 2
(B) 5 < 7 and 7 > 2 and 5 > 2
(C) 5 < 7 and 7 > 2 or 5 $\leq$ 2
(D) 5 < 7 and 7 > 2 and 5 $\leq$ 2

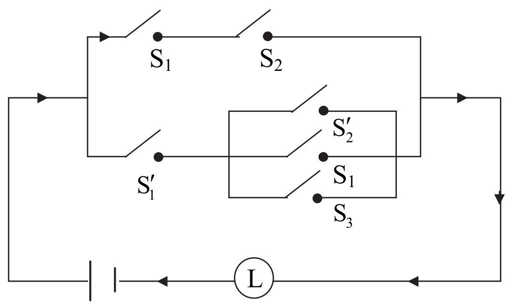
44. The dual of statement 'Mangoes are delicious but expensive' is **[2020]**
(A) Mangoes are delicious or Mangoes are expensive
(B) Mangoes are delicious or Mangoes are not expensive
(C) mangoes are not delicious and mangoes are not expensive
(D) mangoes are delicious and Mangoes are expensive

45. The negation of the statement pattern $\sim p \vee (q \rightarrow \sim r)$ is **[2020]**
(A) $p \wedge (q \wedge r)$ (B) $p \vee (q \wedge r)$
(C) $\sim p \wedge (q \wedge r)$ (D) $p \rightarrow (q \wedge \sim r)$

46. If A = {2, 3, 4, 5, 6}, then which of the following statement has truth value 'false' **[2020]**
(A) $\exists\, x \in$ A, such that x + 2 is a prime number
(B) $\exists\, x \in$ A, such that $x^2 + 1$ is an even number
(C) $\forall\, x \in$ A, x + 6 is divisible by 2
(D) $\exists\, x \in$ A, such that $(x - 2) \in$ N

47. The logical expression $[p \wedge (q \vee r)] \vee [(\sim p \wedge q) \vee (\sim p \wedge r)]$ is equivalent to **[2020]**
(A) q (B) $p \wedge r$
(C) p (D) $q \vee r$

48. The symbolic from of the following circuit is



(where p, q and r represents switches s_1, s_2 and s_3 which are closed respectively) **[2020]**
(A) $(p \wedge q) \vee \sim p \vee [\sim p \vee p \vee r] \equiv l$
(B) $[(p \vee q) \wedge \sim p] \vee [\sim p \vee q \vee r)] \equiv l$
(C) $(p \wedge q) \vee [\sim p \wedge (\sim q \vee p \vee r)] \equiv l$
(D) $(p \vee q) \wedge [\sim p \vee (\sim q \wedge p \wedge r)] \equiv l$

49. The negation of the statement, $\exists x \in A$ such that $x + 5 > 8$ is **[2020]**

(A) $\forall x \in A$ such that $x + 5 \leq 8$

(B) $\forall x \in A$ such that $x + 5 > 8$

(C) $\exists x \in A$ such that $x + 5 < 8$

(D) $\forall x \in A$ such that $x + 5 \geq 8$

50. Which of the following statement pattern is a contradiction?

$S_1 \equiv (p \rightarrow q) \wedge (p \wedge \sim q)$

$S_2 \equiv [p \wedge (p \rightarrow q)] \rightarrow q$

$S_3 \equiv (p \vee q) \rightarrow \sim p$

$S_4 \equiv [p \wedge (p \rightarrow q)] \leftrightarrow q$ **[2020]**

(A) S_3 (B) S_4

(C) S_2 (D) S_1

51. The contrapositive of the statement 'If Raju is courageous, then he will join Indian Army', is **[2020]**

(A) If Raju does not join Indian Army, then he is not courageous.

(B) If Raju join Indian Army, then he is not courageous

(C) If Raju join Indian Army, then he is courageous.

(D) If Raju does not join Indian Army, then he is courageous.

52. If the symbolic form of the switching circuit is $[(\sim p \vee (p \wedge \sim q)] \vee q$, then the current flows through the circuit only if **[2020]**

(A) both switches should be closed

(B) irrespective of status of the switches

(C) One switch should be open and other should be closed

(D) both switches should be open

53. The verbal statement of the same meaning, of the statement 'If the grass is green then it rains in July' is **[2020]**

(A) The grass is not green and it does not rains in July.

(B) The grass is not green or it rains in July

(C) The grass is not green if and only if it rains in July

(D) If the grass is not green, then it does not rain in July

54. If p : Seema is fat.

q : She is happy,

then the logical equivalent statement of 'If Seema is fat, then she is happy' is **[2020]**

(A) Seema is fat and she is happy.

(B) Seema is not fat or she is happy

(C) Seema is fat or she is happy

(D) Seema is not fat or she is unhappy

55. The negation of a statement '$x \in A \cap B \rightarrow (x \in A$ and $x \in B)$' is **[2021]**

(A) $x \in A \cap B \rightarrow (x \in A$ or $x \in B)$

(B) $x \in A \cap B$ and $(x \notin A$ or $x \notin B)$

(C) $x \in A \cap B$ or $(x \in A$ and $x \in B)$

(D) $x \notin A \cap B$ and $(x \in A$ and $x \in B)$

56. p : It rains today

q : I am going to school

r : I will meet may friend

s : I will go to watch a movie.

Then symbolic form of the statement "If it does not rain today or I won't go to school then I will meet my friend and I will go to watch a movie" is **[2021]**

(A) $\sim(p \vee q) \rightarrow (r \vee s)$

(B) $(p \wedge q) \rightarrow (r \vee s)$

(C) $\sim(p \wedge q) \rightarrow (r \wedge s)$

(D) $(\sim p \wedge q) \rightarrow (r \wedge s)$

57. Negation of the satement $\forall x \in R, x^2 + 1 = 0$ is **[2021]**

(A) $\exists x \in R$ such that $x^2 + 1 < 0$.

(B) $\exists x \in R$ such that $x^2 + 1 \leq 0$.

(C) $\exists x \in R$ such that $x^2 + 1 \neq 0$.

(D) $\exists x \in R$ such that $x^2 + 1 = 0$

58. If p, q are true statements and r is false statement, then which of the following is correct? **[2021]**

(A) $(p \vee q) \vee r$ has truth value F.

(B) $(p \wedge q) \rightarrow r$ has truth value T.

(C) $(p \rightarrow r) \rightarrow q$ has truth value F.

(D) $(p \leftrightarrow q) \rightarrow r$ has truth value F.

59. Given p : A man is judge, q : A man is honest

If S_1 : If a man is a judge, then he is honest

S_2 : If a man is a judge, then he is not honest

S_3 : A man is not a judge or he is honest

S_4 : A man is a judge and he is honest

Then **[2021]**

(A) $S_2 \equiv S_3$ (B) $S_1 \equiv S_2$

(C) $S_2 \equiv S_4$ (D) $S_1 \equiv S_3$

60. S_1 : If -7 is an integer, then $\sqrt{-7}$ is a complex number

S_2 : -7 is not an integer or $\sqrt{-7}$ is a complex number **[2021]**

(A) S_1 and S_2 are converse statements of each other

(B) S_1 and S_2 are negations of each other

(C) S_1 and S_2 are equivalent statements

(D) S_1 and S_2 are contrapositive of each other

61. "If two triangles are congruent, then their areas are equal." Is the given statement, then the contrapositive of the inverse of the given statement is
(Where p : Two triangles are congruent, q : Their areas are equal) **[2021]**
(A) If two triangles are not congruent, then their areas are equal.
(B) If two triangles are not congruent, then their area are not equal.
(C) If areas of two triangles are equal, then they are congruent.
(D) If areas of two triangles are not equal, then they are congruent.

62. The negation of '$\forall\ x \in$ N, $x^2 + x$ is even number' is **[2021]**
(A) $\forall\ x \in$ N, $x^2 + x$ is not an even number.
(B) $\forall\ x \in$ N, $x^2 + x$ is not an odd number.
(C) $\exists\ x \in$ N such that $x^2 + x$ is an even number.
(D) $\exists\ x \in$ N such that $x^2 + x$ is not an even number.

63. If p : It is raining.
q : Weather is pleasant
Then simplified form of the statement "It is not true, if it is raining then weather is not pleasant" is **[2021]**
(A) It is not raining or weather is pleasant.
(B) It is raining or weather is not pleasant.
(C) It is raining or weather is not pleasant.
(D) It is raining and the weather is pleasant.

64. The negation of the statement 7 is greater than 4 or 6 is less than 7 **[2021]**
(A) 7 is not greater than 4 and 6 is not less than 7
(B) 7 is not greater than 4 or 6 is not less than 7
(C) 7 is greater than 4 and 6 is less than 7
(D) None of the above

65. The contrapositive of the statemnt. 'If $2^2 = 5$, then I get first class' is **[2021]**
(A) If I do not get a first class, then $2^2 = 5$
(B) If I do not get a first class, then $2^2 \neq 5$
(C) If I get a first class, then $2^2 = 5$
(D) None of the above

66. The truth value of the statement 'Patna is in Bihar or 5 + 6 = 111' is **[2021]**
(A) True
(B) False
(C) Cannot say anything
(D) None of these

67. The negation of a statement '$x \in A \cap B \rightarrow (x \in A \text{ and } x \in B)$' is **[2021]**
(A) $x \in A \cap B \rightarrow (x \in A \text{ or } x \in B)$
(B) $x \in A \cap B$ or $(x \in A \text{ and } x \in B)$
(C) $x \in A \cap B$ and $(x \notin A \text{ or } x \notin B)$
(D) $x \notin A \cap B$ and $(x \in A \text{ and } x \in B)$

68. If $(p \wedge \sim r) \rightarrow (\sim p \vee q)$ has truth value 'F', then truth values of p, q and r are respectively. **[2022]**
(A) T, F, F (B) F, F, F
(C) F, F, T (D) T, T, T

69. Consider the statement "P(n) : $n^2 - n + 37$ is prime."
Then, which one of the following is true? **[2022]**
(A) Both P(3) and P(5) are false.
(B) Both P(3) and P(5) are true.
(C) P(3) false, but P(5) is true
(D) P(5) is false, but P(3) is true.

70. Negation of a statement 'If $\forall\ x$, x is a complex number, then $x^2 < 0$' is **[2022]**
(A) $\exists\ x$, x is not a complex number and $x^2 \geq 0$
(B) $\forall x$, x is a complex number and $x^2 < 0$.
(C) $\exists x$, x is not a complex number and $x^2 < 0$.
(D) $\forall x$, x is a complex number and $x^2 \geq 0$.

71. The statement pattern
$[p \rightarrow (q \rightarrow p)] \rightarrow [p \rightarrow (p \vee q)]$ is **[2022]**
(A) a contingency
(B) a tautology
(C) a contradiction
(D) equivalent to $p \leftrightarrow q$

72. Which of the following is correct statement?
(a) $S_1 : (p \wedge q) \equiv \sim(p \rightarrow \sim q)$
(b) $S_2 : (p \wedge q) \wedge (\sim p \vee \sim q)$ is tautology.
(c) $S_3 : [p \wedge (p \rightarrow \sim q)] \rightarrow q)$ is contradiction.
(d) $S_4 : p \rightarrow (q \rightarrow p)$ is contingency. **[2022]**
(A) statement S_1 is correct.
(B) statement S_4 is correct.
(C) statement S_3 is correct.
(D) statements S_1 and S_2 are correct.

73. If p : 25 is an odd prime number,
q : 14 is a composite number and
r : 64 is a perfect square number.
Then which of the following statement pattern is true? **[2022]**
(A) $\sim(q \wedge r) \vee p$ (B) $\sim p \vee (q \wedge r)$
(C) $(p \wedge q) \wedge r$ (D) $(p \vee q) \wedge (\sim r)$

74. If Statement I : If a quadrilateral ABCD is a square, then all of sides are equal.
Statement II: All the sides of a quadrilateral ABCD are equal, then ABCD is a square. then **[2022]**
(A) Statement II is a negation of statement I.
(B) statement II is an inverse of statement I.
(C) statement II is a converse of statement I.
(D) statement II is a contrapositive of statement I.

75. The negation of the statement
"The payment will be made if and only if the work is finished in time." is **[2022]**
(A) The work is finished in time and the payment is not made.
(B) Either the work is finished in time and the payment is not made or the payment is made and the work is not finished in time.
(C) The payment is made and the work is not finished in time.
(D) The work is finished in time and the payment is not made or the payment is made and the work is finished in time.

76. For three simple statements p, q, and r, $p \to (q \vee r)$ is logically equivalent to **[2022]**
(A) $(p \vee q) \to r$
(B) $(p \to \sim q) \wedge (p \to r)$
(C) $(p \to q) \vee (p \to r)$
(D) $(p \to q) \wedge (p \to \sim r)$

77. Which of the following statement pattern is a contradiction? **[2022]**
(A) $S_4 \equiv (\sim p \wedge q) \vee (\sim q)$
(B) $S_2 \equiv (p \to q) \vee (p \wedge \sim q)$
(C) $S_1 \equiv (\sim p \vee \sim q) \vee (p \vee \sim q)$
(D) $S_3 \equiv (\sim p \wedge q) \wedge (\sim q)$

78. Let p, q, r be three statements, then $[p \to (q \to r)] \leftrightarrow [(p \wedge q) \to r]$ is **[2023]**
(A) equivalent to $p \leftrightarrow q$.
(B) contingency.
(C) tautology.
(D) contradiction.

79. The logical statement
$(\sim (\sim p \vee q) \vee (p \wedge r)) \wedge (\sim q \wedge r)$ is equivalent to **[2023]**
(A) $\sim p \vee r$ (B) $(p \wedge \sim q) \vee r$
(C) $(p \wedge r) \wedge \sim q$ (D) $(\sim p \wedge \sim q) \wedge r$

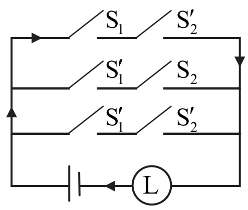
80. If truth value of logical statement $(p \leftrightarrow \sim q) \to (\sim p \wedge q)$ is false, then the truth values of p and q are respectively **[2023]**
(A) F, T (B) T, T
(C) T, F (D) F, F

81. The inverse of the statement
"If the surface area increase, then the pressure decreases.", is **[2023]**
(A) If the surface area does not increase, then the pressure does not decrease.
(B) If the pressure decreases, then the surface area increases.
(C) If the pressure does not decreases, then the surface area does not increase.
(D) If the surface area does not increase, then the pressure decreases.

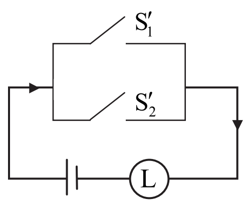
82. The contrapositive of "If x and y are integers such that xy is odd, then both x and y are odd" is **[2023]**
(A) If both x and y are odd integers, then xy is odd.
(B) If both x and y are even integers, then xy is even.
(C) If x or y is an odd integer, then xy is odd.
(D) If both x and y are not odd integers, then the product xy is not odd.

83. Let
Statement 1 : If a quadrilateral is a square, then all of its sides are equal.
Statement 2 : All the sides of a quadrilateral are equal, then it is a square. **[2023]**
(A) Statement 2 is contrapositive of statement 1.
(B) Statement 2 is negation of statement 1.
(C) Statement 2 is inverse of statement 1.
(D) Statement 2 is the converse of statement 1.

84. The given following circuit is equivalent to



[2023]

(A)


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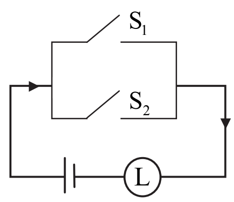
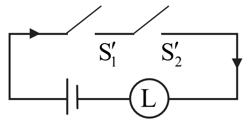


(C)


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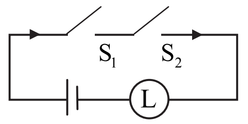


85. If p and q are true statements and r and s are false statements, then the truth values of the statement patterns $(p \wedge q) \vee r$ and $(p \vee s) \leftrightarrow (q \wedge r)$ are respectively **[2023]**

(A) F, T (B) T, T
(C) F, F (D) T, F

86. The negation of the statement pattern $\sim s \vee (\sim r \wedge s)$ is equivalent to **[2023]**

(A) $s \wedge r$
(B) $s \wedge (r \wedge \sim s)$
(C) $s \wedge \sim r$
(D) $s \vee (r \vee \sim s)$

87. Negation of inverse of the following statement pattern $(p \wedge q) \rightarrow (p \vee \sim q)$ is **[2023]**

(A) p (B) ~q
(C) ~p (D) q

88. Negation of contrapositive of statement pattern $(p \vee \sim q) \rightarrow (p \wedge \sim q)$ is **[2023]**

(A) $(\sim p \wedge q) \vee (p \wedge \sim q)$
(B) $(\sim p \vee q) \wedge (p \vee \sim q)$
(C) $(p \wedge \sim q) \vee (\sim p \wedge \sim q)$
(D) $(\sim p \vee \sim q) \wedge (p \vee q)$

89. If q is false and $p \wedge q \leftrightarrow r$ is true, then ________ is a tautology. **[2023]**

(A) $p \vee r$
(B) $(p \wedge r) \rightarrow p \vee r$
(C) $(p \vee r) \rightarrow p \wedge r$
(D) $p \wedge r$

90. The negation of the statement
"The number is an odd number if and only if it is divisible by 3." **[2023]**

(A) The number is an odd number but not divisible by 3 or the number is divisible by 3 but not odd.
(B) The number is not an odd number iff it is not divisible by 3.
(C) The number is not an odd number but it is divisible by 3.
(D) The number is not an odd number or is not divisible by 3 but the number is divisible by 3 or odd.

91. The statement $[(p \rightarrow q) \wedge \sim q] \rightarrow r$ is a tautology, when r is equivalent to **[2023]**

(A) $p \wedge \sim q$ (B) $q \vee p$
(C) $p \wedge q$ (D) ~q

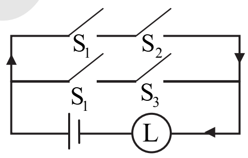
92. If the statement $p \leftrightarrow (q \rightarrow p)$ is false, then true statement/statement pattern is **[2023]**

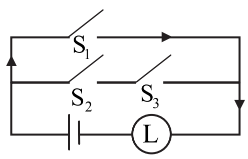
(A) p
(B) $p \rightarrow (p \vee \sim q)$
(C) $p \wedge (\sim p \wedge q)$
(D) $(p \vee \sim q) \rightarrow p$

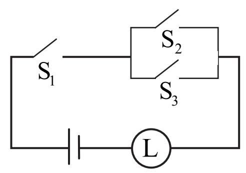
93. If statement I : If the work is not finished on time, the contractor is in trouble.
statement II : Either the work is finished on time or the contractor is in trouble.
then **[2024]**

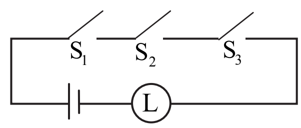
(A) statement II is negation of statement I.
(B) statement II is converse of statement I.
(C) statement II and statement I are equivalent.
(D) statement II is an inverse of statement I.

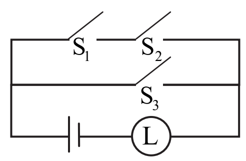
94. Which one of the following is the pair of equivalent circuits?

i.


ii.


iii.


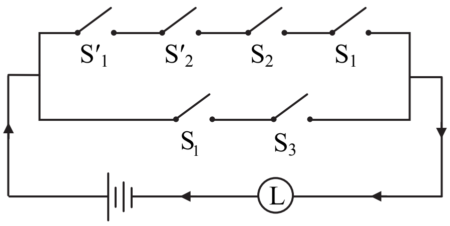
iv.


v.


[2024]

(A) (i) and (ii)
(B) (ii) and (iv)
(C) (iii) and (v)
(D) (i) and (iii)

95. Consider the following statements
p : the switch S_1 is closed.
q : the switch S_2 is closed.
r : the switch S_3 is closed.
Then the switching circuit represented by the statement $(p \wedge q) \vee (\sim p \wedge (\sim q \vee p \vee r))$ is **[2024]**

(A)


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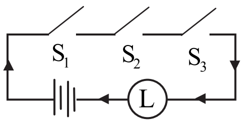

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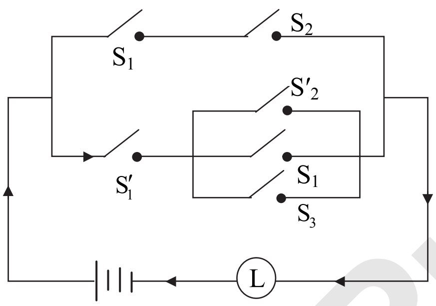

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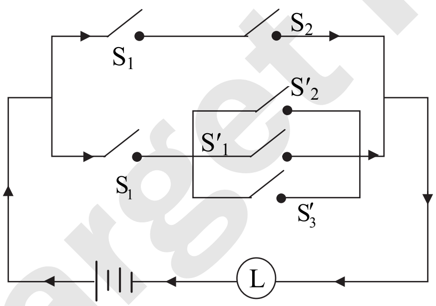

96. If $(p\wedge \sim q)\wedge(p\wedge r)\to \sim p\vee q$ is false, then the truth values of p, q and r are respectively **[2024]**
(A) T, T, T (B) F, F, F
(C) T, F, T (D) F, T, F

97. The converse of $[p\wedge(\sim q)]\to r$ is **[2024]**
(A) $\sim r\to(\sim p\vee q)$
(B) $r\to(\sim p\wedge \sim q)$
(C) $(\sim p\vee q)\to \sim r$
(D) $r\to(p\wedge q)$

98. Consider the statements given by following :
(A) If $3+3=7$, then $4+3=8$.
(B) If $5+3=8$, then earth is flat.
(C) If both (A) and (B) are true, then $5+6=17$.
Then which of the following statements is correct? **[2024]**
(A) (A) is true while (B) and (C) are false.
(B) (A) and (C) are true while (B) is false.
(C) (A) and (B) are false, while (C) is true.
(D) (A) is false but (B) and (C) are true.

99. Negation of the statement "The payment will be made if and only if the work is finished in time." Is **[2024, 2023]**
(A) The work is finished in time and the payment is not made.
(B) The payment is made and the work is not finished in time.
(C) The work is finished in time and the payment is not made, or the payment is made and the work is finished in time.
(D) Either the work is finished in time and the payment is not made, or the payment is made and the work is not finished in time.

100. The inverse of $p \to (q \to r)$ is logically equivalent to **[2024]**
(A) $p \to (q \to r)$
(B) $(q \to r) \to \sim p$
(C) $(p \vee q) \to r$
(D) $(q \to r) \to p$

101. Let p, q and r be the statements
p : X is an equilateral triangle
q : X is isosceles triangle
r : $q \vee \sim p$,
then the equivalent statement of r is **[2024]**
(A) If X is not an equilateral triangle, then X is not an isosceles triangle
(B) X is neither isosceles nor equilateral triangle
(C) X is isosceles but not an equilateral triangle
(D) If X is not an isosceles triangle, then X is not an equilateral triangle.

102. The contrapositive of the inverse of $p\to(p\to q)$ is **[2024]**
(A) $(\sim p\wedge q)\to p$
(B) $(\sim p\vee q)\to p$
(C) $p\to(\sim p\vee q)$
(D) $(p\vee q)\to p$

Answer Key

Classical Thinking

1.1:	1. (D)	2. (D)	3. (C)	4. (D)	5. (A)	6. (D)	7. (C)	8. (B)	9. (B)	10. (C)
	11. (C)	12. (B)	13. (A)	14. (B)	15. (B)	16. (A)	17. (C)	18. (C)	19. (B)	20. (B)
	21. (C)	22. (A)	23. (B)	24. (D)	25. (C)	26. (B)	27. (A)			
1.2:	1. (B)	2. (A)	3. (C)	4. (B)	5. (C)	6. (B)				
1.3:	1. (B)	2. (B)	3. (B)	4. (A)	5. (D)	6. (C)	7. (C)			
1.4:	1. (D)	2. (C)	3. (A)	4. (C)						
1.5:	1. (C)	2. (D)	3. (D)	4. (A)	5. (C)	6. (B)	7. (C)	8. (D)	9. (D)	
1.6:	1. (C)	2. (A)	3. (A)	4. (A)						

MHT-CET Previous Years' Questions

1. (B)	2. (A)	3. (D)	4. (C)	5. (B)	6. (B)	7. (D)	8. (C)	9. (C)	10. (C)
11. (C)	12. (D)	13. (B)	14. (B)	15. (A)	16. (A)	17. (C)	18. (B)	19. (A)	20. (B)
21. (D)	22. (C)	23. (D)	24. (B)	25. (C)	26. (A)	27. (B)	28. (B)	29. (B)	30. (A)
31. (D)	32. (A)	33. (B)	34. (D)	35. (D)	36. (A)	37. (C)	38. (A)	39. (C)	40. (B)
41. (A)	42. (D)	43. (D)	44. (A)	45. (A)	46. (C)	47. (D)	48. (C)	49. (A)	50. (D)
51. (A)	52. (B)	53. (B)	54. (B)	55. (B)	56. (C)	57. (C)	58. (D)	59. (D)	60. (C)
61. (C)	62. (D)	63. (D)	64. (A)	65. (B)	66. (A)	67. (C)	68. (A)	69. (D)	70. (D)
71. (B)	72. (A)	73. (B)	74. (C)	75. (B)	76. (C)	77. (D)	78. (C)	79. (C)	80. (C)
81. (A)	82. (D)	83. (D)	84. (A)	85. (D)	86. (A)	87. (B)	88. (B)	89. (B)	90. (A)
91. (D)	92. (B)	93. (C)	94. (D)	95. (C)	96. (C)	97. (C)	98. (B)	99. (D)	100. (D)
101. (D)	102. (B)								

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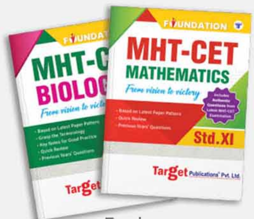

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