MTH202 Discrete Mathematics

Question No. 1:

If \( p = \text{It is raining} \) \( q = \text{She will go to college} \)

"It is raining and she will not go to college" will be denoted by

- \( p \land \neg q \)
- \( p \land q \)
- \( \neg (p \land q) \)
- \( \neg p \land q \)

Question No. 2:

The negation of “Today is Friday” is

- Today is Saturday
- Today is not Friday
- Today is Thursday
- None of given

Question No. 3:

The converse of the conditional statement \( p \implies q \) is

- \( q \implies p \)
- \( \neg q \implies \neg p \)
- \( \neg p \implies \neg q \)
- None of these

Question No. 4:

Contra-positive of given statement “If it is raining, I will take an umbrella” is

- I will not take an umbrella if it is not raining. (Pg 19)
- I will take an umbrella if it is raining.
- It is not raining or I will take an umbrella.
- None of these.

Question No. 5:

A statement is also referred to as a

- Proposition (pg 4)
- Conclusion
- Order
- None of these

Question No. 6:

The statement “It is not raining if and only if roads are dry” is logically equivalent to

- If roads are dry then it is not raining.
- Roads are dry if and only if it is not raining
- If it is not raining then roads are dry.
- None of these.

Question No. 7:

The statement \( \neg (\neg p) = p \) Describes

- Commutative Law
- Implication Laws
- Double negative law
- Equivalence

Question No. 8:

An arrangement of rows and columns that specifies the truth value of a compound proposition for all possible truth values of its constituent propositions is called

- Truth Table
- Venn diagram
- False Table
- None of these

Question No. 9:

An argument is _____ if the conclusion is true when all the premises are true.

- Valid (Pg 25)
- Invalid
- False
- None of these

Question No. 10:

The row in the truth table of an argument where all premises are true is called

- Valid row
- Invalid row
- Critical row (Pg 27)
- None of these
Question No. 11:
The statement \( p \rightarrow q \equiv (p \land \neg q) \rightarrow c \) describes

- Commutative Law
- Implication Laws
- Exportation Law
- **Reductio ad absurdum**

Question No. 12:
\( p \leftrightarrow q \) is logically equivalent to \( (p \rightarrow q) \land (q \rightarrow p) \)

- TRUE
- FALSE

Question No. 13:
According to biconditional 1+1=3 if and only if sky is yellow.

- TRUE (Pg 20)
- FALSE

Question No. 14:
A statement that is always true regardless of the truth values of the statement variables called Tautology.

- TRUE (Pg 10)
- FALSE

Question No. 15:
If \( p \) and \( q \) are statement variables, then the conjunction of \( p \) and \( q \) is “\( p \) and \( q \)” denoted as \( "p \lor q" \).

- TRUE
- FALSE

Question No: 3 (Marks: 1) - Please choose one
For two sets \( A,B \)
\[ A \cap (B \cup C) = (A \cap B) \cup (A \cap C) \] is called

- Distributivity of intersection over union
- Distributivity of union over intersection
- None of these
- Distributivity Law

Question No: 6 (Marks: 1) - Please choose one
Check whether

\[
\begin{align*}
36 &\equiv 1 \pmod{5} & 36 \text{ Modulus 5 } &= 1 \text{ remainder} \\
33 &\equiv 3 \pmod{10} & 33 \text{ Modulus 10 } &= 3 \text{ remainder}
\end{align*}
\]

- Both are equivalent
- Second one is equivalent but first one is not
- First one is equivalent but second one is not

Question No: 7 (Marks: 1) - Please choose one
A binary relation \( R \) is called Partial order relation if

- It is Reflexive and transitive
- It is symmetric and transitive
- It is reflexive, symmetric and transitive
- It is reflexive, anti-symmetric and transitive (Pg 92)

Question No: 8 (Marks: 1) - Please choose one
The order pairs which are not present in a relation, must be present in

- Inverse of that relation
- Composition of relations
- Complementary relation of that relation (pg 97)
Question No: 9  (Marks: 1)  - Please choose one
The relation as a set of ordered pairs as shown in figure is

- \{(a,b),(b,a),(b,d),(c,d)\}
- \{(a,b),(b,a),(a,c),(b,a),(c,c),(c,d)\}
- \{(a,b), (a,c), (b,a),(b,d), (c,c),(c,d)\}
- \{(a,b), (a,c), (b,a),(b,d),(c,d)\}

Question No: 10  (Marks: 1)  - Please choose one
A circuit with two input signals and one output signal is called

- NOT-gate (or inverter)
- AND-gate
- None of these

Question No: 11  (Marks: 1)  - Please choose one
If \(f(x)=2x+1\) then its inverse =

- \(x-1\)
- \(\frac{1}{2}(x-1)\)
- \(x^2 +2\)

\(f(x)=2x+1\)
\(y=2x+1\)
\(x = \frac{y-1}{2}\)
\(f(x)^{-1} = \frac{y-1}{2}\)

Question No: 12  (Marks: 1)  - Please choose one
Null set is denoted by

- (phi) or \{\}. (pg 39)
- \(A\)
- None of these

Question No: 13  (Marks: 1)  - Please choose one
The total number of elements in a set is called

- Strength
- Cardinality (pg 141)
- Finite

Question No: 14  (Marks: 1)  - Please choose one
If \( f(x) = x + 1 \) and \( g(x) = -2x^2 + 1 \) then \((2f - 1g)(x) = \)

\[
\begin{align*}
&= (2f - 1g)(x) \\
&= 2f(x) - g(x) \\
&= 2(x + 1) - (-2x^2 + 1) \\
&= 2x + 2 + 2x^2 - 1 \\
&= 2x^2 + 2x + 1 \\
\end{align*}
\]

**Question No: 15** (Marks: 1) - Please choose one

Let \( a_0 = 1, a_1 = -2 \) and \( a_2 = 3 \) then \( \sum_{j=0}^{2} a_j = \)

\[
\begin{align*}
&\to -6 \\
&\to 2 \\
&\to 8 \\
\end{align*}
\]

**Question No: 16** (Marks: 1) - Please choose one

Which of the given statement is incorrect?

\[
\begin{align*}
&\to \text{The process of defining an object in terms of smaller versions of itself is called recursion. (Pg 159)} \\
&\to \text{A recursive definition has two parts: Base and Recursion.} \\
&\to \text{Functions cannot be defined recursively (Pg 159)} \\
&\to \text{Sets can be defined recursively. (Pg 165)} \\
\end{align*}
\]

**Question No: 17** (Marks: 1) - Please choose one

The operations of intersection and union on sets are commutative

\[
\begin{align*}
&\to \text{True (Pg 42)} \\
&\to \text{False} \\
&\to \text{Depends on the sets given} \\
\end{align*}
\]

**Question No: 18** (Marks: 1) - Please choose one

The power set of a set \( A \) is the set of all subsets of \( A \), denoted \( P(A) \).

\[
\begin{align*}
&\to \text{False} \\
&\to \text{True (Pg 68)} \\
\end{align*}
\]

**Question No: 19** (Marks: 1) - Please choose one

What is the output state of an OR gate if the inputs are 0 and 1?

\[
\begin{align*}
&\to 0 \\
&\to 1 \\
&\to 2 \\
&\to 3 \\
\end{align*}
\]

**Question No: 20** (Marks: 1) - Please choose one

The product of the positive integers from 1 to \( n \) is called

\[
\begin{align*}
&\to \text{Multiplication} \\
&\to \text{\( n \) factorial} \\
&\to \text{Geometric sequence} \\
\end{align*}
\]

**Question No: 6** (Marks: 1) - Please choose one

Let \( A = \{1, 2, 3, 4\} \) and \( R = \{(1, 1), (2, 2), (3, 3), (4, 4)\} \) then
Question No: 7 (Marks: 1) - Please choose one
The inverse of given relation
\[ R = \{(1,1),(1,2),(1,4),(3,4),(4,1)\} \]
- \[ \{(1,1),(2,1),(4,1),(2,3)\} \]
- \[ \{(1,1),(1,2),(4,1),(4,3),(1,4)\} \]
- \[ \{(1,1),(2,1),(4,1),(4,3),(1,4)\} \] (Pg 95)

Question No: 11 (Marks: 1) - Please choose one
\[ (A \cap B)^c = (A^c \cap B^c) \]
- True
- False

Question No: 13 (Marks: 1) - Please choose one
Let \( g \) be the functions defined by
\[ g(x) = 3x + 2 \] then \( gog(x) = \)
- \( 9x^2 + 4 \)
- \( 6x + 4 \)
- \( 9x + 8 \)

\[ g(g(x)) = g(3x + 2) \]
\[ = 3(3x + 2) + 2 \]
\[ = 9x + 6 + 2 \]
\[ = 9x + 8 \]

Question No: 16 (Marks: 1) - Please choose one
The common fraction for the recurring decimal 0.81 is
\[ \frac{81}{100} \]
- \[ \frac{81}{98} \]
- \[ \frac{9}{11} \]
(Pg 157)

Question No: 17 (Marks: 1) - Please choose one
A collection of rules indicating how to form new set objects from those already known to be in the set is called
- Base
- Restriction
- Recursion (Pg159)

Question No: 19 (Marks: 1) - Please choose one
The statement of the form \( p \lor \sim p \) is:
- Tautology (Pg 10)
- Contradiction
- Fallacy

Question No: 20 (Marks: 1) - Please choose one
Let \( A, B, C \) be the subsets of a universal set \( U \).
\[ (A \cup B) \cup C \]
Then \( A \cap (B \cup C) \) is equal to:
- \( A \cap (B \cup C) \)
Question: If \( R = \{(a, a), (b, b), (c, c)\} \) is a relation on the set \( A = \{a, b, c\} \) Then \( R \) is
- Symmetric only.
- Symmetric and reflexive only.
- Reflexive only.
- Equivalence relation. (Pg 85)

Question: The negation of the implication “If \( P \) is a square then \( P \) is a rectangle” is
- If \( P \) is not a square then \( P \) is not a rectangle
- \( P \) is not a square and \( P \) is a rectangle
- \( P \) is a square and \( P \) is not a rectangle.
- None of the above

Question: Identify the false statement
- \( 0 \in \emptyset \)
- \( \{\emptyset\} \subseteq \emptyset \)
- If \( A \) and \( B \) are two sets \( A \subset B \) and \( B \subset A \) then \( A = B \).
- Two sets are disjoint if their intersection is empty set.
- \( A \cup A^c = U \)

Question: Let \( A \) be a set containing 3 elements then the total number of relations from \( A \) to \( A \) is
- \( 2^9 \)
- \( 2^8 \)
- \( n^8 \)
- \( 2n \)

Question: Let \( A = \{1, 2, 3\} \) and \( B = \{2, 3, 4, 5\} \) then
- \( A = B \).
- \( A \) is a subset of \( B \).
- \( A \) is improper subset of \( B \).
- Both 2 and 3.

Question: Which of the following is not a Proposition?
- \( x > 11 \)
- Sun rounds about the Earth
- \( 11 + 7 = 18 \)
- None of above.

Question: \( F = \{x \in \mathbb{R} \mid x^2 + 29x - 12 = 0\} \)
- finite
- infinite
- (c ) none of above

Question: Let \( A \) has the same cardinality as \( B \) if and only if ,there is a correspondence between sets \( A \) and \( B \)
- one-one
- onto
- (c ) Both (a) and (b) (Pg 141)

Question: Let \( A = \{0, 1, 2, 3, 4, 5\} \) and we define functions \( f: A \rightarrow A \) and then \( g: A \rightarrow A \)
\[
\begin{align*}
f(3) &= 3, & f(4) &= 2, & f(5) &= 2, & f(2) &= 5, & f(1) &= 2 \\
g(1) &= 4, & g(3) &= 3, & g(5) &= 3, & g(2) &= 1
\end{align*}
\]
then \( f \circ g \) and \( g \circ f \)
- (a ) \( f \circ g \) = gof(2)
- (b) \( f \circ g \) = gof(2)
- (c) \( f \circ g \) = gof(1)
- (d) None of the above
Question: Choose the correct answer:
If f and g are two one-to-one functions, then their composition of gof is
- onto
- one-to-one (Pg 134)
- (c) bijective

Question: If 1=1 then 2=2, the conditional statement is
- True
- False
- None of other.

If \(1^1 + 2^1 + 3^1 + \ldots + n^1 = \)
Then,
\[
\frac{n(n+1)}{2}
\]

Question: A set Z has n elements. How many functions are from Z to Z?
- \(2^n\)
- \(n \times n\)
- \(n^n\)
- None of the other

Question: Compute the summation
\[
\sum_{i=0}^{2} (i^2 + 2)
\]
- 5
- 3
- 0
- None of these.

Question: Let \(S = \{ n \in \mathbb{Z} / n = (-1)^k, \text{ for some integer } k \}\)
- \(S = \{1\}\)
- \(S = \{-1\}\)
- \(S = \{-1,1\}\)
- None of the other

Question: If p=T, q=T, r=F
Then
\( ( \neg p \land r) \rightarrow (q \land r) \)
Must be
- \(F\)
- \(T\)
- \(q \lor r\)
- None of these.

Question: If \(A = \{a,b,c,d\}\) then the number of elements of power set \(P(A)\) are
Consider the relation \( R = \{(1,1),(1,2),(1,4),(2,1),(2,2),(3,3),(4,4)\} \) on \( A = \{1,2,3,4\} \) is

► Symmetric
► Transitive
► Reflexive
► All of these

The function defined by the following diagram is \( f: X \rightarrow Y \)

► One-to-one
► Onto
► Both one-to-one and onto
► None of these

The sequence \( 1, 10, 10^2, 10^3, 10^4, 10^5, 10^6, \ldots \) is

► Arithmetic series (Pg 145)
► Geometric series
► Arithmetic sequence
► Geometric sequence

Negations for the given statement “The train is late or my watch is fast” is

► The train is not late or my watch is not fast.
► The train is not late and my watch is not fast.
► The train is not late or my watch is fast
► None of these.

Let \( R \) be the relation from \( A = \{a_1, a_2, a_3\} \) (Elements of \( A \) are ordered by their subscript) to itself given by the matrix representation. Then \( R \) is

\[
\begin{pmatrix}
0 & 1 & 0 \\
1 & 0 & 1 \\
0 & 1 & 0 \\
\end{pmatrix}
\]

► Reflexive and Symmetric.
► Symmetric and Transitive.
► Irreflexive and Symmetric.
► Irreflexive and Anti-Symmetric.

If out of 35 people each person like Discrete Mathematics or Data Structures, 25 like Discrete Mathematics, and 20 like Data Structures then the number of people who like
Question: Inverse of a function may not be a function
► True (Pg 124)
► False

Question No: 1 (Marks: 1) - Please choose one
The inverse of given relation \( R = \{(1,1),(1,2),(1,4),(3,4),(4,1)\} \) is
► \( \{(1,1),(2,1),(4,1),(2,3)\} \)
► \( \{(1,1),(1,2),(4,1),(4,3),(1,4)\} \)
► \( \{(1,1),(2,1),(4,1),(4,3),(1,4)\} \)

Question No: 2 (Marks: 1) - Please choose one
Symmetric and antisymmetric are
► Negative of each other
► Both are same
► Not negative of each other (Pg 90)

Question No: 3 (Marks: 1) - Please choose one
Let \( A = \{a, b, c\} \) and
\( R = \{(a, c), (b, b), (c, a)\} \) be a relation on \( A \). Is \( R \)
► Transitive
► Reflexive
► Symmetric
► Transitive and Reflexive

Question: In Boolean addition \( 1+1= \)
► 2
► 1 (Pg 99)
► 0

Question No: 8 (Marks: 1) - Please choose one
The same element can never appear twice in a set
► True
► False

Question No: 9 (Marks: 1) - Please choose one
\( g(x)=x^2 -1 \)
If \( f(x)=2x+1, \) then \( fg(x)= \)
► \( x^2 -1 \)
► \( 2x^2 -1 \)
► \( 2x^3 -1 \)
Question No: 13  ( Marks: 1 ) - Please choose one
If a set contains exactly \( m \) distinct elements where \( m \) denotes some non negative integer then the set is .

► Finite
► Infinite
► None of these

Question No: 14  ( Marks: 1 ) - Please choose one
If \( f(4) = 1 \) and \( g(1) = 4 \) then \( f \circ g(1) = \)

► 3
► 1
► 4

\[ (f \circ g)(1) = f(g(1)) = f(4) = 1 \]

Question No: 15  ( Marks: 1 ) - Please choose one
If \( (A \cup B) = A \), then \( (A \cap B) = B \)

► True
► False
► Cannot be determined

Question No: 16  ( Marks: 1 ) - Please choose one
The total number of elements in a set is called

► Strength
► Cardinality
► Finite

Question No: 17  ( Marks: 1 ) - Please choose one
If \( f(x) = x \) and \( g(x) = -2x \) then \( (f+g)x = \)

► 3x
► 2x
► -x

Question No: 19  ( Marks: 1 ) - Please choose one
Which term of the sequence 4, 1, -2, … is -77

► 26
► 27
► 28

Question No: 20  ( Marks: 1 ) - Please choose one
If a set \( A \) has 5 elements then power set of \( A \). \( P(S) \) contains elements. Which are?

► \( 5^5 \)
► \( 2^n \)
► \( 4^5 \)
► \( 2^5 \)
Question No: 13  (Marks: 1)  - Please choose one
Let $g$ be the functions defined by $g(x)= 3x+2$ then $gog(x) =$

$\begin{align*}
&\begin{cases} 
9x^2 + 4 \\
6x+4 \\
9x+8
\end{cases} \\
&g(g(x)) \\
&= 3(3x + 2) + 2 \\
&= 9x + 6 + 2 \\
&= 9x + 8
\end{align*}$