

MIDTERM EXAMINATION
Fall 2009
MTH202- Discrete Mathematics

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

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 No: 4 (Marks: 1) - Please choose one

Let $A = \{1, 2, 3, 4\}$ and $R = \{(1, 1), (2, 2), (3, 3), (4, 4)\}$ then

- ▶ R is symmetric.
- ▶ R is anti symmetric.
- ▶ R is transitive.
- ▶ R is reflexive.
- ▶ All given options are true

Question No: 5 (Marks: 1) - Please choose one

The contrapositive of the conditional statement $p \rightarrow q$ is

- ▶ $\sim p \rightarrow \sim q$
- ▶ $q \rightarrow p$
- ▶ $\sim q \rightarrow \sim p$

► None of these

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

In Boolean addition $1+1=$

► 2

► 1

► 0

Question No: 7 (Marks: 1) - Please choose one

The negation of "Today is Friday" is

► Today is Saturday

► Today is not Friday

► Today is Thursday

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

If $f(x)=2x+1$, $g(x)=x^2-1$ then $fg(x)=$

► x^2-1

► $2x^2-1$

► $2x^3-1$

Question No: 10 (Marks: 1) - Please choose one

The statement $p \leftrightarrow q \leftrightarrow \sim p \leftrightarrow q \leftrightarrow \sim(p \leftrightarrow \sim q)$

describes

► Commutative Law

► Implication Laws

► Exportation Law

► Equivalence

Question No: 11 (Marks: 1) - Please choose one

If two sets are not equal, then one must be a subset of the other

▶ True

▶ False

Question No: 12 (Marks: 1) - Please choose one

If f and g are two one-to-one functions then their composition that is $g \circ f$ is

▶ Not one-to-one

▶ Onto

▶ One-to-one

▶ Onto and one-to-one

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

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 $(f+g)x =$

▶ $3x$

▶ $2x^2$

▶ $-x$

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

Associative law of Intersection for three sets

▶ $A \cap (B \cap C) = (A \cap B) \cap C$

▶ $A \cap (B \cap C) = (A \cap B) \cap C$

▶ $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

▶ None of these

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

Which term of the sequence $4, 1, -2, \dots$ 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: 21 (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

Question No: 22 (Marks: 1) - Please choose one

$1, 10, 10^2, 10^3, 10^4, 10^5, 10^6, 10^7, \dots$ is

▶ Arithmetic series

Arithmetic series

► **Geometric series**

► Arithmetic sequence

► Geometric sequence

Question No: 23 (Marks: 1) - Please choose one

$$\sum_{j=1}^3 (3j - 5) =$$

► 4

► **3**

► -2

Question No: 24 (Marks: 1) - Please choose one

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

► Multiplication

► n factorial

► **Geometric sequence**

Question No: 25 (Marks: 3)

Consider the geometric progression $5/7, 5/49, 5/343, \dots$

- Identify r
- Find the n th term of this progression
- If the above progression is to be added up to infinite terms then what could be the sum?

Answer:-

$$r = ?$$

$$\begin{aligned} r &= \frac{a_2}{a_1} \\ r &= \frac{49/7}{5/7} \\ r &= \frac{49}{7} \times \frac{7}{5} \\ r &= \frac{49}{5} \end{aligned}$$

n th term=?

$$a_1 = 5/7$$

$$r = 49/5$$

$$a_n = ?$$

Formula

$$a_n = a_1 r^{n-1}$$

$$a_n = (5/7)(49/5)^{n-1}$$

Sum=?

$$\text{As } n \geq 1$$

So, formula is:-

$$S_n = \frac{a(1-r)}{1-r}$$

$$S_n = \frac{5/7(1-49/5)}{1-49/5}$$

$$S_n = \frac{5/7(\frac{5-49}{5})}{\frac{1-49}{5}}$$

$$S_n = \frac{5/7(\frac{-44}{5})}{\frac{-48}{5}} = \frac{5}{7} \times \frac{44}{48}$$

$$S_n = \frac{5 \times 44}{7 \times 48} = \frac{5 \times 11}{7 \times 12} = \frac{55}{84}$$

$$S_n = \frac{55}{84}$$

Question No: 26 (Marks: 5)

Determine whether the following statement is tautology or not (use truth table)

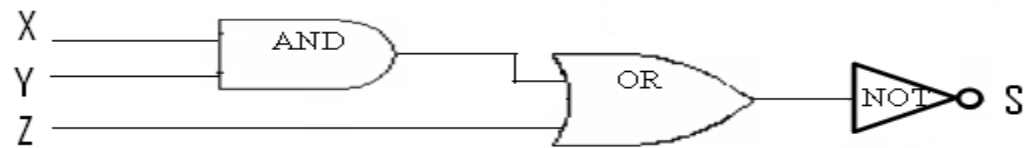
$$\sim q \vee (q \rightarrow p) \rightarrow \sim p$$

p	q	$\sim p$	$\sim q$	$q \rightarrow p$	$\sim q \vee (q \rightarrow p)$	$\sim q \vee (q \rightarrow p) \rightarrow \sim p$
1	1	0	0	1	1	0
1	0	0	1	1	1	0
0	1	1	0	0	0	1
0	0	1	1	1	1	1

Hence, it is not a tautology as there are two false.

Question No: 27 (Marks: 10)

Write an input/output table for the circuit:



Input signals are:

X = 1

Y = 0

Z = 0

X	Y	Z	$X \wedge Y$	$(X \wedge Y) \vee Z$	$\sim[(X \wedge Y) \vee Z]$
1	0	0	0	0	1
