**IV Semester BCA**

16MATH0G1-ELEMENTS OF DISCRETE MATHEMATICS

**Unit I: Logic I & II**

**Two marks Questions:**

1. What are Propositions give an example.
2. Define Simple Propositions give an example.
3. What are Compound Propositions give example.
4. Define Negation and write the truth table.
5. State Conjunction [AND] and write the truth table.
6. What is Disjunction [OR] and write the truth table.
7. Define Exclusive Disjunction [XOR] and write the truth table.
8. Define Conditional [if then] and write the truth table.
9. State Biconditional [iff] and write the truth table.
10. What is NAND and write the truth table.
11. Define NOR and write the truth table.
12. What is Tautology and Contradiction/ Absurdity.
13. State Logical Equivalence and Dual.
14. State Converse, Inverse, and Contrapositive of a conditional.
15. What is Open statement give an example.
16. What is Quantified Statement give an example.
17. Define Universal Quantifier and Existential Quantifier.
18. Construct the truth table for the compound proposition.
19. Write the truth table for .
20. Construct the truth table for .

**Five Marks Questions:**

* 1. Construct the truth table for the following compound proposition
     1. .
     2. .

1. Given is true & is false find the truth value of the following.
   * 1. .
     2. .
2. Prove the following propositions are tautology.

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1. Check whether the following propositions are tautology or contradiction

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1. Check whether the following compound propositions are logically equally or not.

[(p.

1. Prove that [(p.
2. Using Laws of logic prove the following

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1. Using Laws of logic prove the following

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1. Let be the propositions having the truth values respectively. Find the truth values of the following compound propositions.
2. (p.
3. (p.
4. (p
5. .
6. Write the proposition and test the validity of the following arguments.

If a person is poor, he is unhappy.

If a person is unhappy, he dies young .

poor person dies young.

1. Write the proposition and test the validity of the following arguments.

If Dhoni hits a century then he gets a free car.

Dhoni gets a free car .

Dhoni has hit a century.

1. Write the proposition and test the validity of the following arguments.

If Ravi goes out with friends, he will not study.

If Ravi does not study, his father will become angry.

His father is not angry .

Ravi has not gone out with friends.

1. Write the following Propositions in symbolic form, negate and simplify, express in words.

“All integers are rational numbers and some rational numbers are not integers”

1. Write the following Propositions in symbolic form, negate and simplify, express in words.

“If all triangles have three sides then some squares are rectangles”.

1. Write the following Propositions in symbolic form, negate and simplify, express in words.

“If k, m, n are any integers, if (k-m) and (m-n) are odd, then (k-n) is even”.

**Seven Marks Questions:**

1. Construct the truth table for
   1. .
   2. .
   3. .
2. Prove by using laws of logic

{(p.

1. Write Converse, Inverse, & Contrapositive of the following.

Quadrilateral is a parallelogram.

Diagonals of quadrilateral bisects each other.

1. Write Converse, Inverse, & Contrapositive of the conditional “If a triangle is not Isosceles then it is not equilateral”
2. Write Converse, Inverse, & Contrapositive “If she passes in mathematics, the professor will resign”
3. If , , and then find truth value of
   1. .
   2. .
4. If the proposition has the truth value 1 determine the truth values of for which the truth value of the following compound proposition is 1

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1. For all the universe of all integers let . Write the following quantified statement in symbolic form.
   1. At least one integer is even.
   2. Every integer is either even or odd but not both.
   3. If x is odd or x is not divisible by 7 then x is divisible by 3.
2. For all the universe of all integers let . Write the following symbolic form in words and indicate the truth values
   1. .
   2. .
   3. .
3. Write a short note on open statement and quantified statement.

**Unit II: Basics of Counting, Relations & Functions**

**Two marks Questions:**

1. Define sum Rule with an example.
2. Define product rule with an example.
3. How many committees of five with a given chairperson can be selected from 12 persons?
4. Find the number of permutations of the letters of the world “CHEMISTRY”? Also in how many ways a word of four distinct letters can be formed.
5. Find the number of permutations of the letters of the word “PROGRESS”.
6. Find the number of permutations of the letters of the word “MATHEMATICS”.
7. Find the number of permutations of the letters of the word “ENGINEERING”.
8. Find the number of permutations of the letters of the word “DIFFICULT”.
9. A license plate consists of two English letters followed by four digits. if repetitions are allowed, how many have only vowels and even digits?
10. There are four bus routes between place A and B and three bus routes between place B and C find the number of ways a person can make a round trip from A to A w find the number of ways a person can make a round trip from A to A via B and C if he does not uses a bus more than 5 B and C if he does not used as a bus more than once.
11. A certain question paper contains two parts A and B each contains 4 questions how many different ways a student can answer my questions by selecting at least two questions from each part.
12. 15 Player squad was named by a cricket selection board and captain was also named who always leader team of 11 members in how many ways a team can be chosen? A player injured in a practice and he can never play any match. In how many ways a team can be chosen?
13. define explicit and recursive method.
14. state finite set. and infinite sets with an example each.
15. Illustrate power set with an example.
16. define one - one and onto function.
17. State the pigeonhole principle with an example.
18. define identity function and inverse function.
19. If nP2=132, find the value of n.
20. Obtain the recursive definition for .

**Five Marks Questions:**

1. Find the number of ways in which 8 shirts and 4 sweaters how to be distributed among five selected old people in an old age home such that each one gets at least one shirt.
2. Explain sum rule and product rule with an example.
3. In a class of 52 students, 30 a study in C++, 28 are studying Pascal and 13 are studying body languages. How many in this class are studying at least one of these languages? How many are studying neither of these languages?
4. In a sample of 100 logic chips Comma 23 have a defect D1, 26 have a defect D2, 30 have the defect D3, 7 have defects D1 and D2, 8 have defects D1 and D3, 10 have defects D2 and D3and 3 have all the three defects. find the number of chips having at least one defects and no defects
5. Prove by mathematical induction that
6. Prove by mathematical induction that
7. Prove by mathematical induction that
8. Prove by mathematical induction
9. Prove by mathematical induction
10. Prove S(n): by mathematical induction.
11. Prove by mathematical induction that .
12. Obtain the recursive definition for the sequence {an} in each of the following
    1. .
13. A sequence {an} is defined recursively by find in explicit form.
14. A sequence {an} is defined recursively by find in explicit form.
15. For any 3 set for A, B, & C then prove that

**Seven Marks Questions:**

1. Prove by mathematical induction that
2. find the number of Permutations of the letters of the word “MISSISSIPPI” how many of these
   1. begins with letter I
   2. begins and ends with S
   3. has all I’s together
3. 6 boys and 4 girls got elected as a class representative in your college a five-member student Council has to be formed from the elected class representatives in how many ways this Council can be formed such that
   1. There are 3 boys and 2 girls.
   2. at least two girls.
   3. at most two boys.
4. Find the number of permutations of the letters of the word “ENGINEERING” such that
   1. all the E’s are together.
   2. G and R Park next to each other.
   3. all vowels are adjacent
5. A computer company require 30 programmers to handle system programming jobs and 40 programmers for application programming. If the company appoints 55 programmers to carry out the job, how many of these perform jokes of both types? How many handles only system programming jobs? How many handles only application programming?
6. There are 200 individuals with a skin disorder, 120 has been exposed to the chemical C1, 50 two chemical C2, and 30 to both the Chemicals C1 and C2. find the number of individuals exposed to
   1. chemical C1 but not chemical C2.
   2. chemical C2 but not chemical C1.
   3. chemical C1 or chemical C2.
7. Prove that every Z+, can be written as a sum of 5’s and/ or 7’s.
8. Consider the function f and g defined by , find .
9. Let f from R to R be a function defined by

Find

1. Show hat among one lakh people at least two people are born at the same hour, minute and second.

**Unit III: Properties of Relations**

**Two marks Questions:**

1. Define Composition of Relation and give an example.
2. What is Reflexive relations give an example.
3. State Symmetric relation and give an example.
4. Define Antisymmetric relation give an example.
5. What is Transitive Relation give an example.
6. Illustrate Equivalence relation with an example.
7. Illustrate partial order with an example.
8. If Find .
9. Let find and write its matrix representation
10. Let and relations are as follows aRa, aRb, bRa, bRb, bRc, bRd, cRd, dRa, dRd. Write down the matrix representation.
11. Find indegree outdegree of the following digraph
12. If write the relation and diagraph.
13. Let be a relation on find .
14. Write the difference between Diagraph and Hasse diagram.
15. Define upper and lower bound.
16. State Supremum and Infimum.
17. Define Maximal element and minimal element.
18. State greatest element and least element.
19. Find all upper and lower bound of
20. Identify the maximal and minimal elements of

**Five Marks Questions:**

1. Let A={1, 2, 3, 4, 5, 6} and R be a relation defined by aRbiff “a is a multiple of b” then
   1. Write R as ordered pair.
   2. Write matrix of relation.
   3. Draw digraph.
   4. Find indegree outdegree of all vertex.
2. The digraph for a relation on the set A={1, 2, 3, 4} is as shown below. Verify that (A, R) is a poset and draw its Hasse diagram.
3. Let A={1, 2, 3, 4} and R be a relation defined by aRbiff “a divides b” then
   1. Write R as ordered pair.
   2. Write matrix of relation.
   3. Draw digraph.
   4. Find indegree outdegree of all vertex.
4. Let Find (i) , (ii)
5. Let A={1,2,3,4,6,12} and on A define the relation R by aRb if “ a divides b” write the relation set and draw the Hasse diagram.
6. Let A={1, 2, 3, 4} and R be a relation defined by xRyiff “” then
   1. Write R as ordered pair.
   2. Write matrix of relation.
   3. Draw digraph.
   4. Find indegree outdegree of all vertex.
7. If write R, construct the digraph and list out all indegree outdegree.
8. Find Relation, Matrix of relation, indegree, outdegree of the following digraph
9. If write the relation, diagraph, indegree and out degree.

**Seven Marks Questions:**

1. Explain equivalence relation.
2. Explain partial order.
3. Write a short note on Representing Relation.
4. Define equivalence relation. Verify that “*x-y* is a multiple of 5” is an equivalence relation.
5. Define equivalence relation. Verify that “*congruent modulo n*” is an equivalence relation
6. Let Find (i) , (ii) , (iii) , (iv) , (v) , (vi) .
7. Show that divisibility relation is a partial order on the set and draw its Hasse diagram.
8. Draw the Hasse diagram for all positive integer divisor of 72.
9. If R is a relation on defined by xRy if x divides y. prove that (A, R) is a poset. Draw its Hasse diagram.
10. If r is a relation on defined by xRy if x divides y. prove that (A, R) is a poset. Draw its Hasse diagram.