Model Question Paper

Reg No:

Name:

RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

FIRST SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2022

101009/MA100 A

DISCRETE MATHEMATICS

Max. Marks: 100 **Duration: 3 hours**

PART A

(Answer **all** questions, **each** question carries 3 marks)

1. Simplify the Boolean expression $a'.b'.c + a.b'.c + a.b'.c'$,using Boolean algebra identities.
2. Prove that $a + \overline{a}b = a + b$
3. Define the relation R on the set of positive integers by $(x, y) \in R$ if the greatest common divisor of x and y is 1. Determine whether R is reflexive, symmetric, antisymmetric, transitive, and/ or a partial order.
4. Find the cross product of sets $A = \{1,2,3\}$, $B = \{a, b\}$
5. Find the number of students in a class to be sure that four out of them are born on the same month.
6. Find the associated homogeneous solution for $a_n = 3a_{n-1} + 2n$.
7. Define Euler graph. Give an example.
8. Define Planar graph. State Euler formula.
9. Show that $(\neg p) \rightarrow (p \rightarrow q)$ is a tautology
10. Translate the sentences into propositional expressions:

    "Neither the fox nor the lynx can catch the hare if the hare is alert and quick."

PART B

(Answer **one full** question from each module, each question carries **14** marks)

Module –I

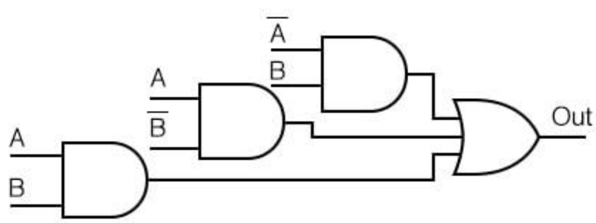
11. **a)** Reduce the expression $a(a+c) = aa + ac$.

b) Discuss about Logic gates.

12. a) For the Truth table below, transfer the outputs to the Karnaugh, then write the Boolean expression for the result.

A	**B**	**Output**
0	**0**	**0**
0	**1**	**1**
1	**0**	**1**
1	**1**	**1**

b) Simplify the logic diagram below.



Module –II

13 a) At Sunnydale High School there are 55 students in either algebra, biology, or chemistry class,28 students in algebra class, 30 students in biology class, 24 students in chemistry class, 8 students in both algebra and biology, 16 students in both biology and chemistry, 5 students in both algebra and chemistry. How many students are in all three classes?

b) State any two properties of a group. Give an example of a subgroup.

14. a) Prove that (A,.) is a non abelian group where A= R*×R & (a, b).(c, d)= (ac, bc +d)

b) Define ring. Give examples.

Module –III

15\. a) Let$\boldsymbol{S} \subset \boldsymbol{Z}^+$, where$|\boldsymbol{S}| = \mathbf{37}$. Show that $\boldsymbol{S}$ contains two elements that have the same remainder upon division by $\mathbf{36}$.

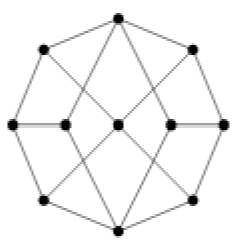
b) Find the recurrence relation for the sequence $a_n = 2n + 9, n \geq 1$

16\. a) Define an equivalence relation. Let m be a fixed positive integer. Two integers a and b are said to be congruent modulo m, written $a \equiv b(mod\, m)$ if m divides $a - b$. Show that relation of *'congruence modulo m'* is an equivalence relation.

b) Prove that **n !** > $\mathbf{2^n}$ for n a positive integer greater than or equal to 4.

Module –IV

17\. Consider the following graph:



a. Find a Hamilton path. Can your path be extended to a Hamilton cycle?

b. Is the graph bipartite? If so, how many vertices are in each "part"?

18\. a) Draw a graph with chromatic number 6 (i.e., which requires 6 colors to properly colour the vertices). Could your graph be planar? Explain.

b) Which of the following graphs contain an Euler path? Which contain an Euler circuit?

a) K4 b) K5

Module –V

19. **a)** Show the following equivalence, using truth tables: $P \Rightarrow Q \equiv Q \vee \neg P$

b) Determine whether the following arguments are valid or invalid:

Premises:

a. If I read the newspaper in the kitchen, my glasses would be on the kitchen table.
b. I did not read the newspaper in the kitchen.

Conclusion : My glasses are not on the kitchen table.

20. **a)** Write the contrapositive, converse and inverse of the expressions: $P \rightarrow Q, \sim P \rightarrow Q, Q \rightarrow \sim P$

b) Show that the premises $E \rightarrow S, S \rightarrow H, A \rightarrow \sim H, \quad E \wedge A$ are inconsistent.

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