

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS

II-B.TECH-I-Semester End Examinations (Supply) – August - 2023
DISCRETE MATHEMATICS
(Common to CSE, IT & CSM)

[Time: 3 Hours]

[Max. Marks: 70]

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 20 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A**(20 Marks)**

1. a) Define the Rules of Inference and give one example. [2M]
- b) Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology. [2M]
- c) Determine for which constant a, b, c and d it is true that $f \circ g = g \circ f$, if $f(x) = ax + b$ and $g(x) = cx + d$, where a, b, c and d are constants. [2M]
- d) If A and B be sets. Show that $(A \cap B) \subseteq A$. [2M]
- e) Describe the characteristics of the algorithm. [2M]
- f) Give an overview of recursive Algorithms? [2M]
- g) State Baye's Theorem. [2M]
- h) State principle of inclusion – exclusion. [2M]
- i) Briefly write about tree Properties. [2M]
- j) If G is a simple graph with 15 edges and G has 13 vertices, How many vertices does G have? [2M]

PART-B**(50 Marks)**

- 2.a) Prove that, all integers are rational numbers. Some integers are powers of 2. [5M]
Therefore, some rational numbers are powers of 2. [5M]
- b) Find DNF of $p \rightarrow [(p \rightarrow q) \wedge \sim (\sim q \vee \sim p)]$

OR

3. Test the validity of the following argument [10M]

$$p \wedge r \rightarrow \neg q, \neg q \rightarrow r \therefore p \wedge r \rightarrow r$$

4. Show that the sequence $\{a_n\}$ is a solution of the recurrence relation [10M]
 $a_n = a_{n-1} + 2a_{n-2} + 2n - 9$ if $a_n = 7 \cdot 2^n - n + 2$.

OR

5. Draw the HASSE diagram for $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$ by divisibility. [10M]

6. Prove that $G(n) = 2n - 4$ for $n \geq 4$.

OR

7. Prove that $7^{n+2} + 8^{2n+1}$ is divisible by 57 for every non negative integer n, Using [10M]
mathematical induction.

8. Solve recurrence relation $a_n = 3a_{n-1} - 2a_{n-2}$, for $n \geq 2$ using generating functions? [10M]

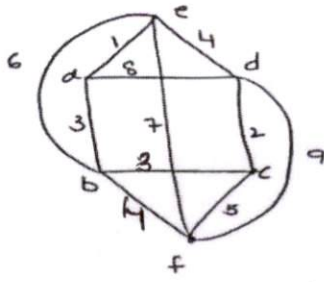
OR

9. In a certain town 40% have brown hair, 25% have brown eyes and 15% have both [10M]
brown hair & brown eyes. A person is selected random from the town
 - i. If he has brown hair, what is the probability that he has brown eyes?
 - ii. How many people in town have neither brown hair nor brown eyes?

- 10 a). Prove that, Every Hamiltonian graph is 2 – connected. [5M]
 b). Prove that in a graph the no. of odd degree vertices must be even. [5M]

OR

- 11.a) Find the minimal spanning tree for the graph using Kruskal's algorithm [5M]



- b) Show that every planar graph G can be colored using five or fewer colors. [5M]
