

## CMR TECHNICAL CAMPUS

## UGC AUTONOMOUS

B. Tech. IV Semester Supply End Examinations, July/August-2023

## Discrete Mathematics

## Common to CSE &amp; IT

Time: 3 Hours

Max. Marks: 70

## Note

- This Question paper contains Part- A and Part- B.
- All the Questions in Part A are to be answered compulsorily.
- All Questions from Part B are to be answered with internal choice among them.

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## PART-A

10 X 02 = 20 Marks

	Marks	CO	BL
1. a Express the specification " The automated reply can't be sent when the file system is full " using logical connectives.	2	CO1	L2
b Let $Q(x, y)$ denote the statement " $x = y + 3$ ". What are the truth values of $Q(1,2)$ and $Q(3,0)$ ?	2	CO1	L3
c Draw the directed graph of the relation $R = \{(1,1), (1,3), (2,1), (2,3), (2,4), (3,1), (3,2), (4,1)\}$ on the set $\{1,2,3,4\}$ .	2	CO2	L2
d Find the value of $\sum_{k=5}^{10} k^2$ .	2	CO2	L3
e Show that $7x^2$ is $O(x^3)$ .	2	CO3	L3
f Write the recursive definition of $a^n$ , where $a$ is a non zero real number and $n$ is a non negative integer.	2	CO3	L2
g What is the probability that a card selected from a deck of cards is an ace?	2	CO4	L3
h Find the generating function for the sequence $1, 3, 3^2, 3^3, \dots$	2	CO4	L3
i Define bipartite graph.	2	CO5	L1
j Define Planar Graph	2	CO5	L3

## PART- B

5 X 10 = 50 Marks

	Marks	CO	BL
2. a Show that $q \vee (p \wedge \neg q) \vee (\neg p \wedge \neg q)$ is a tautology without using truth table.	5	CO1	L3
b Translate each of the following into logical expressions using predicates and quantifiers and logically connectives. (i) No one is perfect (ii) Not everyone is perfect (iii) One of your friends is perfect (iv) Everyone is your friend and is perfect.	5	CO1	L2

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OR

- 3 a Show that the premises “everyone in this discrete mathematics class has taken a course in computer science” and “Marla is a student in the class” imply the conclusion “Marla has taken a course in computer science.” 5 CO1 L3
- b Give an indirect proof of the theorem if  $3n + 2$  is odd then  $n$  is odd. 5 CO1 L3

- 4 a Let  $I$  denote the set of all positive integers and  $m$  be a positive integer. Show that the relation  $R = \{(x, y) \mid x - y \text{ is divisible by } m, x \in I, y \in I\}$  on  $I$  is an equivalence relation. 5 CO2 L3
- b Show that  $f: R \rightarrow R$ , where  $R$  is the set of all real numbers defined by  $f(x) = 2x - 3$  is a bijection and find its inverse. 5 CO2 L3

OR

- 5 a Let  $f(x) = x^2 - 2$  and  $g(x) = x + 4$  be the functions defined on real numbers. Then find  $f \circ g$  and  $g \circ f$ . 5 CO2 L3
- b Draw the Hasse diagram representing the partial ordering  $\{(a, b) \mid a \text{ divides } b\}$  on  $\{1, 2, 3, 4, 6, 8, 12\}$ . 5 CO2 L2

- 6 a Describe the bubble sort algorithm. 5 CO3 L2
- b Explain the time complexity of the linear search algorithm. 5 CO3 L2

OR

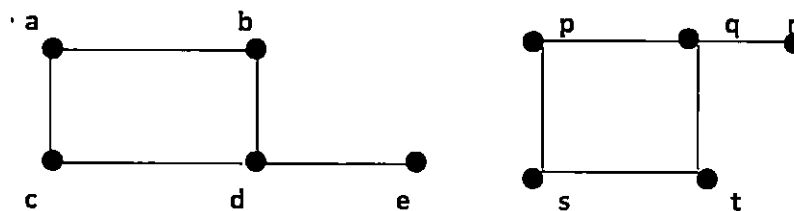
- 7 a Use mathematical induction to show that  $1 + 2 + 2^2 + 2^3 + \dots + 2^n = 2^{n+1} - 1$  for all non-negative integers. 5 CO3 L3
- b Describe binary search algorithm. 5 CO3 L2

- 8 a Define sequence with an example? 5 CO4 L3
- b What is the expected value of the sum of the numbers that appear when a pair of fair dice is rolled? 5 CO4 L3

OR

- 9 a Solve the recurrence relation  $a_n = 2a_{n-1} + 2^n, a_0 = 2$ . 5 CO4 L3
- b How many positive integers not exceeding 1000 are divisible by 7 or 11? 5 CO4 L3

- 10 a Prove that the following two graphs are isomorphic 5 CO5 L3



- b Show that  $K_{3,3}$  is not a planar graph. 5 CO5 L3

OR

- 11 a Explain Breadth First Search(BFS) Algorithm with an example? 5 CO5 L3
- b Discuss minimal spanning tree with an example. 5 CO5 L2