Code No.: DS402PC | R20 | H.T.No. | | | 8 | R | | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–II–Semester End Examinations (Regular) - August- 2023
DISCRETE MATHEMATICS
(Common to CSC, CSD, AI&DS)

[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)	Construct a truth table to show that (pVq) → p is a tautology.	[2M]
	b)	Explain Normal Forms.	[2M]
	c)	Let X = {1, 2, 3, 4, 5, 6} and R be a relation defined as (x, y) belongs to R if and only if x - y is divisible by 3. Find the elements of relation of R.	[2M]
	d)	Discuss about the equivalence and transitive relation.	[2M]
	e)	What is Strong Induction?	[2M]
	f)	Describe the Basis of counting.	[2M]
	g)	Find how many different words that can be formed with the letters in the word "MATHEMATICS"?	[2M]
	h)	Give any two applications of generating functions.	[2M]
	i)	What is a planar graph? Give examples of planar and non-planar graphs.	[2M]
	j)	Define Spanning Trees with examples.	[2M]

PART-B **(50 Marks)**

2.		Show that if *p,q,* and r are compound propositions such that *p* and *q* are logically Equivalent and *q* and r are logically equivalent, then *p* and r are logically equivalent.	[10M]
		OR	
3.	a)	Using indirect proof , derive P → ~ S from P → (Q V R) , Q → ~ P, S → ~ R , P.	[5M]
	b)	What is Converse, Inverse and Contra positive for "If it is raining then home town wins".	[5M]
4.		By using functions solve the following Let the Function f: N→ $\mathbb{N}$ and g: $\mathbb{Z} \rightarrow \mathbb{N}$ be defined as follows f(n)=3n+2 and g(n)= n^2+1 Find i. fog ii. gof	[10M]
		OR	
5.		Use set builder notation and logical equivalences to establish the first demorgan's law.	[10M]
6.		Explain Briefly about the asymptotic notations with examples of each.	[10M]
		OR	
7.		Use mathematical induction to show that $1+2+2^2+\ldots\ldots+2^n=2^{n+1}-1$.	[10M]

8.a) What is divide and conquer algorithm write with an example. [5M]

b) How to select a first prize winner, Second prize winner, and third prize winnerfrom 75 different people who have entered a contest. [5M]

OR

9.a) Solve the recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0$ for $n \geq 2$. [5M]

b) Consider the following recursive function definition: If x < y, then f(x, y) = 0; If y-x, then f(x, y) = f(x-y, y) + 1. Find the value of f (5861, 7). [5M]

10. Define graph. Graph G is represented by the following adjacency matrix [10M]
[0 1 1 1 0 1 0 1 0 1 1 1 0 0 1 1 0 0 0 1 0 1 1 1 0]
i. Draw the graph.
ii. Determine whether "G" is a tree. justify your answer.
iii. Determine whether "G" is a Eulerian graph. Justify your answer
iv. Determine whether "G" is Hamiltonian Graph. If it is so, Provide a Hamiltonian cycle on "G"

OR

11.a) Write and explain the tree traversals in detail. [5M]

b) What are the steps involved in Kruskal's algorithm for finding a minimum spanning tree. [5M]

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