

# ADAMAS UNIVERSITY

## END SEMESTER EXAMINATION

(Academic Session: 2020 – 21)

<b>Name of the Program:</b>	MCA	<b>Semester:</b>	II
<b>Paper Title:</b>	Discrete Mathematics	<b>Paper Code:</b>	MTH21519
<b>Maximum Marks:</b>	50	<b>Time Duration:</b>	3 Hrs
<b>Total No. of Questions:</b>	17	<b>Total No of Pages:</b>	2
(Any other information for the student may be mentioned here)	<ol style="list-style-type: none"> <li>At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name &amp; Code, Date of Exam.</li> <li>All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.</li> <li>Assumptions made if any, should be stated clearly at the beginning of your answer.</li> </ol>		

### Group A

**Answer All the Questions (5 x 1 = 5)**

1	What is equivalence relation?	<b>Remembering</b>	<b>CO1</b>
2	What is right coset?	<b>Remembering</b>	<b>CO2</b>
3	What is generating function?	<b>Understanding</b>	<b>CO3</b>
4	What do you mean by degree of a vertex of a graph?	<b>Applying</b>	<b>CO4</b>
5	What is Euler's tour a cycle?	<b>Applying</b>	<b>CO4</b>

### Group B

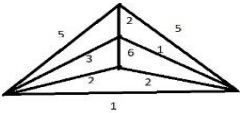
**Answer All the Questions (5 x 2 = 10)**

6 a)	Find whether $(p \wedge q \rightarrow p \vee q)$ is a tautology or not.	<b>Remembering</b>	<b>CO1</b>
<b>(OR)</b>			
6 b)	What is well formed formula?	<b>Remembering</b>	<b>CO1</b>
7 a)	Show that in a group left inverse is also right inverse.	<b>Remembering</b>	<b>CO2</b>
<b>(OR)</b>			
7 b)	In a group $(G, \cdot)$ show that $(a^{-1})^{-1} = a, \forall a \in G$ .	<b>Remembering</b>	<b>CO2</b>
8 a)	If $\gcd(a,b) = 1$ then show that $\gcd(a+b, a-b) = 1$ or $2$ .	<b>Understanding</b>	<b>CO3</b>
<b>(OR)</b>			
8 b)	What is Pigeon hole principle?	<b>Understanding</b>	<b>CO3</b>
9 a)	Show that every cyclic group is abelian.	<b>Remembering</b>	<b>CO2</b>
<b>(OR)</b>			
9 b)	Show that intersection of two subgroups is also a subgroup.	<b>Remembering</b>	<b>CO2</b>
10 a)	What is proper subgraph and spanning subgraph?	<b>Applying</b>	<b>CO4</b>
<b>(OR)</b>			
10 b)	Show that the number of vertices of odd degree is always even.	<b>Applying</b>	<b>CO4</b>

### Group C

**Answer All the Questions (7 x 5 = 35)**

11 a)	Show that the following argument is valid or not $p \vee q, q \rightarrow r, p \rightarrow s, \sim s \Rightarrow r$ .	<b>Remembering</b>	<b>CO1</b>
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<b>(OR)</b>			
11 b)	A relation $\beta$ is defined on $\mathbb{Z}$ by “ $x\beta y$ if and only if $x^2 - y^2$ is divisible by 5” for , $y \in \mathbb{Z}$ . Show that $\beta$ is an equivalence relation on $\mathbb{Z}$ .	Remembering	CO1
12 a)	Show that $(R - \{1\}, *)$ is an abelian group, where the binary operation “ $*$ ” is defined as $\forall a, b \in R - \{1\}, a * b = a + b - ab$ .	Remembering	CO2
<b>(OR)</b>			
12 b)	Show that the cube roots of unity forms an abelian group under complex multiplication.	Remembering	CO2
13 a)	Show that there are infinite number of primes.	Understanding	CO3
<b>(OR)</b>			
13 b)	In a group of people there are 750 who can speak Hindi and 400 who can speak in Bengali. How many can speak Hindi and Bengali both? How many can speak Bengali only? How many can speak?	Understanding	CO3
14 a)	Show that a simple graph with $n(\geq 2)$ vertices must have at least one pair of vertices whose degrees are equal.	Applying	CO4
<b>(OR)</b>			
14 b)	Explain that a graph is a tree if and only if it is minimally connected.	Applying	CO4
15 a)	Show that a tree with $n$ vertices has $n-1$ edges.	Applying	CO4
<b>(OR)</b>			
15 b)	Find the minimal spanning tree of the following graph by Kruskal’s algorithm  	Applying	CO4
16 a)	Let $G$ be a group and $a, b \in G$ such that $a^4 = e, ab = ba^2$ then show that $a = e$ .	Remembering	CO2
<b>(OR)</b>			
16 b)	Show that the set $G = \{a + b\sqrt{2} : a, b \in \mathbb{Q}\}$ is a group with respect to addition.	Remembering	CO2
17 a)	Show that $a^{n+1} - (a - 1)n - a$ is divisible by $(a - 1)^2$ , $a$ being an integer.	Understanding	CO3
<b>(OR)</b>			
17 b)	Illustrate the nonhomogeneous recurrence relation, $a_n = 4a_{n-1} + 4^n, (n \geq 1)$ with $a_0 = 3$ .	Understanding	CO3