M.M. ENGINEERING COLLEGE, MULLANA (AMBALA)

DEPARTMENT OF CSE

Tutorial / Assignment Sheet No. : 1.4

Branch / Semester: CSE / 4th **Course Name:** Discrete Mathematics **Course Code:** BCSE-508

Topics covered: Principles of Mathematical Induction, Multisets (Unit-1)

Date of Release: 03.02.2021 **Last date of submission:** 10.02.2021 **Total Marks:** 30

Assignment Outcomes:

i) Able to map the real life problem using the concepts of Multisets.

ii) Able to solve various problems related to Mathematical Induction.

Q. No.	"All Questions are compulsory"	Marks
	Section-A (Each question of 1 mark)	06
1.	Define the following terms related to multisets: i) Multiset with example ii) Application of multisets iii) Multiplicity of element iv) Cardinality of multiset v) Operation on multisets vi) Difference between set & multiset	
	Section-B (Each question of 2 mark)	10
2.	Prove by mathematical induction that $5^{n+2} + 6^{2n+1}$ is divisible by 31 for all natural numbers n.	
3.	Prove by mathematical induction that $x^{n-1} - 1$ is divisible by $x - 1$, for all $n \geq 0$.	
4.	Prove by mathematical induction that sum of the cubes of three consecutive integers are divisible by 9.	
5.	Show that any integer composed of 3^n identical digits is divisible by 3^n.	
6.	Show that $n^3 + 2n$ is divisible by 3 for all $n \geq 1$ by induction.	
	Section-C (Each question of 4 mark)	08
7.	When n couples arrived at a party, they were greeted by the host and hostess at the door. After handshaking, the host asked the guests as well as his wife (the hostess) to indicate the number of hands each of them had shaken. He got 2n+1 different answer. Given that no one shook hands with his or her spouse, how many hands had the hostess shaken? Prove your result by induction.	
8.	Prove that $1 + 1/\sqrt{2} + 1/\sqrt{3} + \ldots\ldots + 1/\sqrt{n} > 2(\sqrt{(n+1)} - 1)$ for all integers $n \geq 1$.	
	Section-D (6 mark question)	06
9.	Formulate and prove by induction a general formula stemming from the observation that $1^3 = 1$ $2^3 = 3 + 5$ $3^3 = 7 + 9 + 11$ $4^3 = 13 + 15 + 17 + 19$	

Note for students: Students are required to submit handwritten solutions of given assignment / tutorial sheet on or before Last date of submission otherwise penalty in terms of deduction in marks will be made as per following rule:

If submitted on or before last date then Deduction of marks = 0

If submission delayed by (1-7) days then Deduction of marks = 5

If submission delayed by (8-14) days then Deduction of marks = 10

If submission delayed by more than 15 days then Deduction of marks = 12.5