	Reg. No.:	
	Name :	

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MID TERM EXAMINATIONS – August 2022

Programme	:	B.Tech.[BCY,BAS, MIM]	**Semester**	:	Fall 2022-23
Course	:	Discrete Mathematics And Graph Theory	**Code**	:	MAT2002
Faculty	:	Dr. Navneet Kumar Verma	**Slot/ Class No.**	:	A21+A22+A23/0134
Time	:	1 ½ hours	**Max. Marks**	:	50

Answer all the Questions

Q. No.	Sub. Sec.	Question Description	Marks
1	(a)	Let Z be the set of integers and the relation R be defined over the set Z by aRb *if* $a^b = b^a$, where $a,b \in Z$. Is the relation R an equivalence relation?	5
	(b)	Verify the statement $\overline{(A \cup B)} \cup \overline{(\bar{A} \cap \bar{B} \cap C)} = U$, stating all the used laws clearly.	5
2	(a)	Prove by the principle of mathematical induction the inequality $(a+1)^n \geq 1+na$, *for* $a > -1$ & $n \geq 2$.	5
	(b)	Let R and S be two relations from Set A to Set B then prove that $(R \cup S)^{-1} = R^{-1} \cup S^{-1}$ *and* $.(R \cap S)^{-1} = R^{-1} \cap S^{-1}$	5
3		Write out the converse, contrapositive and negation of each of the following sentences: **a)** If Neha wins, then Shally loses. **b)** If 9 is odd then the square of 9 is odd **c)** If all cat's meow, then some dogs bark If john wins, then Mary loses and the school closes	10
4		Show that $\{[(p \vee q) \Rightarrow r] \wedge (\neg p)\} \Rightarrow (q \Rightarrow r)$ is a tautology without using truth tables.	10
5		A graph without self-loop and parallel edges having 'n' vertices and 'k' components. Then show that such graph cannot have more than $\frac{(n-k)(n-k+1)}{2}$ edges	10

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