II BE Computer Engineering
Class Test-I March 2021
CER4C1 Discrete Structures

Time-70 Mins. **Maximum Marks** **[20]**
Note-Attempt all the questions.

Q.1 A survey was conducted among **1000** people. Of these, **595** are democrats, **595** wear glasses and **550** like ice cream; **395** of them are democrats who wear glasses, **350** of them are democrats who like ice cream and **400** of them wear glasses and like ice cream; **250** of them are democrats who wear glasses and like ice cream. How many of them who are not democrats, do not wear glasses and do not like ice cream? How many of them are democrats and who do not wear glasses and do not like ice cream? **[5]**

Q.2 Let $\boldsymbol{S}$ be the set of all bit strings of length four or more. Let the relation $\boldsymbol{R} \subseteq \boldsymbol{S} \times \boldsymbol{S}$ consists of all pairs $(\boldsymbol{x}, \boldsymbol{y})$ such that $\boldsymbol{x}$ and $\boldsymbol{y}$ are bit strings that agree in their second and fourth bits. Show that $\boldsymbol{R}$ is an equivalence relation and find all the distinct equivalence classes. **[5]**

Q.3 If $\boldsymbol{G} = \left\{ \begin{bmatrix} \boldsymbol{a} & \boldsymbol{0} \\ \boldsymbol{0} & \boldsymbol{0} \end{bmatrix} : \boldsymbol{a} \in \boldsymbol{R_0} \right\}$, where $\boldsymbol{R_0}$ is set of non zero real numbers, then show that $\boldsymbol{G}$ is an abelian group with respect to multiplication. **[5]**

Q.4 $(\boldsymbol{i})$ Change the following Boolean function into conjunctive normal form **[2]**

$$\boldsymbol{f}\ (\boldsymbol{x}, \boldsymbol{y}, \boldsymbol{z}) = \left[\boldsymbol{x} + \left(\boldsymbol{x}^{/} + \boldsymbol{y}^{/}\right)^{/}\right] . \left[\boldsymbol{x} + \left(\boldsymbol{y}^{/} . \boldsymbol{z}^{/}\right)^{/}\right]$$

$(\boldsymbol{ii})$ Draw the simplified circuit of the expression and verify by truth table **[3]**

$$\boldsymbol{f}\ (\boldsymbol{x}, \boldsymbol{y}, \boldsymbol{z}) = \boldsymbol{x}.\boldsymbol{z} + \left[\boldsymbol{y}. \left(\boldsymbol{y}^{/} + \boldsymbol{z}\right) . \left(\boldsymbol{x}^{/} + \boldsymbol{x}.\boldsymbol{z}^{/}\right)\right]$$

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