

Followings are of 2 Marks each (Q01-05).

- Q01.** Let the relation R defined by $(a, b)R(c, d) \Rightarrow a + d = b + c$ on $A \times A$, where set $A = \{1, 2, 3, \dots, 10\}$ is an equivalence relation. Write the equivalence class $[(3, 4)]$.
- Q02.** Let the function $f: \mathbb{R}_+ \rightarrow [-9, \infty)$ given by $f(x) = 5x^2 + 6x - 9$. Show that $f(x)$ is one-one. Here $\mathbb{R}_+$ denotes the set of all non-negative real numbers.
- Q03.** Let R be an equivalence relation defined in the set $A = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ by $R = \{(x, y) : x, y \in A, x \text{ and } y \text{ are either both odd or both even}\}$. Write all the equivalence classes of set A .
- Q04.** Let $A = \{1, 2, 3\}$. Write all the possible equivalence relations defined on set A .
- Q05.** Let $A = \{1, 2, 3, \dots, n\}$. Find the number of all onto functions from the set A to A . Also determine the number of one-one functions from set A to itself. [2 × 5 = 10]

Followings are of 3 Marks each (Q06-07).

- Q06.** A relation R is defined from $\{2, 3, 4, 5\}$ to $\{3, 6, 7, 10\}$ by $x R y \Leftrightarrow x$ is relatively prime to y , then write the domain of R .
Also state if R is reflexive relation or not? Is it transitive relation? Is R a symmetric relation?
- Q07.** Let L be the set of all lines in a plane and $R: L \rightarrow L$ such that $R = \{(L_1, L_2) : L_1 \text{ is perpendicular to } L_2\}$. Examine if the relation R is reflexive, symmetric, transitive and equivalence relation or not.

OR

Let $f: \mathbb{N} \rightarrow \mathbb{N}$ be defined as $f(n) = \begin{cases} \frac{n+1}{2}, & \text{when } n \text{ is odd} \\ \frac{n}{2}, & \text{when } n \text{ is even} \end{cases}$ for all $n \in \mathbb{N}$.

Show that the function f is not one-one but it is onto. Justify your answer.

[3 × 2 = 6]

Following is of 4 Marks (Q08).

- Q08. CASE STUDY :** A general election of Lok Sabha is a gigantic exercise. About 911 million people were eligible to vote and voter turnout was about 67%, the highest ever.

**ONE - NATION
ONE - ELECTION**

FESTIVAL OF DEMOCRACY

GENERAL ELECTION - 2019



Let I be the set of all citizens of India who were eligible to exercise their voting right in general election held in 2019. A relation ' R ' is defined on I as follows.

$$R = \{(V_1, V_2) : V_1, V_2 \in I \text{ and both use their voting right in general election - 2019}\}.$$

Based on the above information, answer the following :

- (i) Let two friends X and $Y \in I$. Suppose X and Y both exercised their voting right in the general election - 2019. Then state if $(X, Y) \in R$ is true or not. Give reason.
- (ii) Mr. 'H' and his wife 'W' both exercised their voting right in general election - 2019. Then state if the following statement is true or not. Give reason.
"If $(H, W) \in R$ then, we may or may not have $(W, H) \in R$."
- (iii) Check if R is reflexive or, symmetric. Give reasons to support your answer.

- (iv) Mr. Ghanshyam exercised his voting right in general election - 2019. While his brother (having voting right), Mr. Radheshyam went to have fun at a nearby mall.

Can we have $(\text{Ghanshyam, Radheshyam}) \in R$? Give reason.

[1 × 4 = 4]

Followings are of 5 Marks each (Q09-10).

Q09. Show that the relation R on the set $\mathbb{R}$ of real nos., defined as $R = \{(a, b) : a \leq b^3; a, b \in \mathbb{R}\}$ is neither reflexive nor symmetric nor transitive.

OR

If R be the relation defined on Q (set of rational numbers) as $a R b \Leftrightarrow |a - b| \leq \frac{1}{2}$, then check if R is reflexive, symmetric or transitive. Is the relation R an equivalence relation?

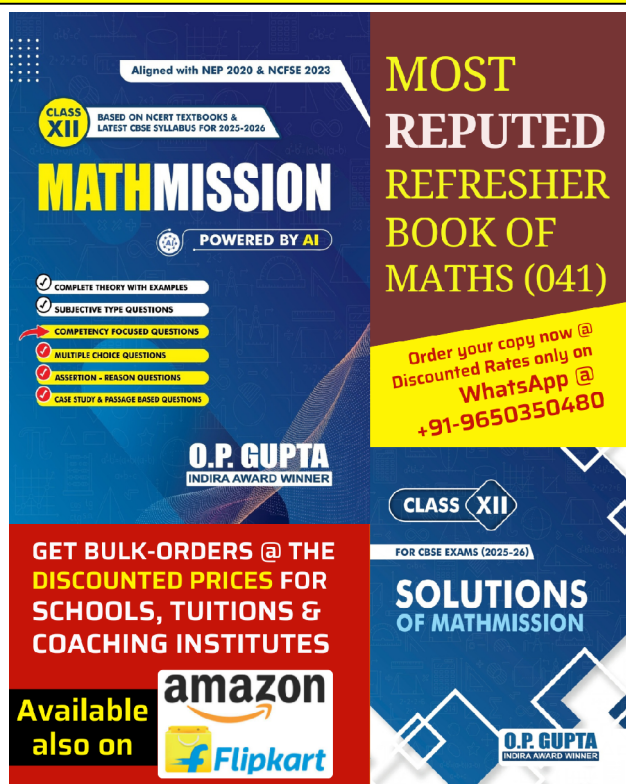
Q10. Let $A = \mathbb{R} - \{1\}$ and $B = \mathbb{R} - \{2\}$. If $f : A \rightarrow B$ is a function defined by $f(x) = \frac{x-2}{x-1}$, then show that the function f is one-one and onto.

[5 × 2 = 10]

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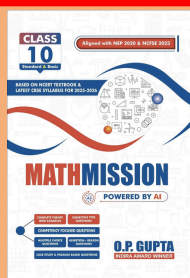
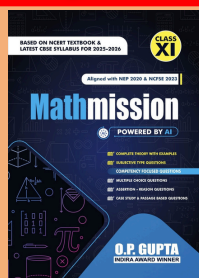
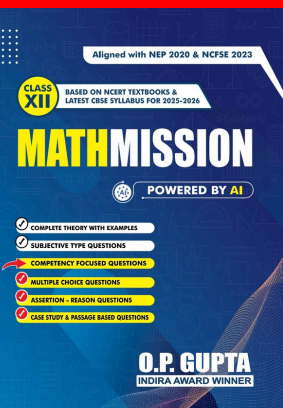
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