

Model Question Paper
Discrete Mathematics - Part III
12th Standard

Maths

Reg.No. :

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I. Answer all the questions.

II. Use Blue pen only.

Time : 01:30:00 Hrs

Total Marks : 80

5 x 1 = 5

Section-A

- 1) Which of the following is not a group?
(a) $(\mathbb{Z}_n, +)$ (b) $(\mathbb{Z}, +)$ (c) $(\mathbb{Z}, \cdot)$ (d) $(\mathbb{R}, +)$
- 2) In the set of integers with operation $*$ defined by $a * b = a + b - ab$, the value of $3 * (4 * 5)$ is
(a) 25 (b) 15 (c) 10 (d) 5
- 3) The order of [7] in $(\mathbb{Z}_9, +_9)$ is
(a) 9 (b) 6 (c) 3 (d) 1
- 4) The value of $[3] +_{11} ([5] +_{11} [6])$ is
(a) [0] (b) [1] (c) [2] (d) [3]
- 5) In the set of real numbers $\mathbb{R}$, an operation $*$ is defined by $a * b = \sqrt{a^2 + b^2}$. Then the value of $(3 * 4) * 5$ is
(a) 5 (b) $5\sqrt{2}$ (c) 25 (d) 50

Section-B

5 x 3 = 15

- 6) Construct the truth table for the following statements: $((\sim p) \vee (\sim q))$
- 7) Construct the truth table for the following statements: $\sim ((\sim p) \wedge q)$
- 8) Prove that identity element of a group is unique.
- 9) Prove that inverse element of an element of a group is unique.
- 10) Show that $(a^{-1})^{-1} = a \quad \forall \quad a \in G$, a group.

Section-C

3 x 6 = 18

- 11) State and prove cancellation laws on groups.
- 12) State and prove reversal law on inverse of a group.
- 13) Construct the truth table for the following statements $(P \vee q) \wedge (\sim q)$

Section-D

3 x 10 = 30

- 14) Show the set G of all matrices of the form $\begin{pmatrix} x & x \\ x & x \end{pmatrix}$ where $x \in \mathbb{R} - \{0\}$ is a group under matrix multiplication.
- 15) a) Show that the set $G = \{a + b\sqrt{2}/a, b \in \mathbb{Q}\}$ is an infinite abelian group with respect to addition.

(OR)

- b) Show that the set $G = \{2^n \mid n \in \mathbb{Z}\}$ is an abelian group under multiplication.
