Model Question Paper

Discrete Mathematics - Part IV

12th Standard

Maths

Reg.No. : | | | | | | |

I.Answer all questions

II.Use Blue pen only.

Time : 01:00:00 Hrs

Total Marks : 75

Section-A

5 x 1 = 5

1) In the set of real numbers 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

2) Which of the following is correct?

(a) An element of a group can have more than one inverse. (b) If every element of a group is its own inverse, then the group is abelian.

(c) The set of all 2 x 2 real matrices forms a group under matrix multiplication. (d) $(a * b)^{-1} = a^{-1} * b^{-1}$ for all a, b ϵ G

3) The order of –i in the multiplicative group of 4^{th} roots of unity is

(a) 4 (b) 3 (c) 2 (d) 1

4) The truth values of the following statements are

i) Paris is in France

ii)sinx is an even function

iii) Every square matrix is non-singular

iv)Jupiter is a planet

(a) T F F T (b) F T F T (c) F T T F (d) F F T T

5) If p is true and q is unknown then

(a) $\sim p$is true (b) $p \vee (-p)$ is false (c) $p \vee (\sim p)$ is true (d) $p \vee q$ is true

Section-B

3 x 3 = 9

6) Prove that identity element of a group is unique.

7) Prove that inverse element of an element of a group is unique.

8) Show that $\left(a^{-1}\right)^{-1} = a \quad \forall \quad a \in G$, a group.

Section-C

5 x 6 = 30

9) Prove that (C,+) is an infinite abelian group

10) Show that the set of all non-zero complex numbers is an abelian group under the usual multiplication of complex numbers

11) Show that the set of all 2 X 2 non-singular matrices forms a non-abelian infinite group under matrix multiplication, (where the entries belong to R).

12) Construct the truth table for the following statements: $\sim ((\sim p) \wedge (\sim q))$

13) Show that $((\sim q) \wedge p) \wedge q$ is a contradiction.

Section-D

3 x 10 = 30

14) Show that the set G of all rational numbers except -1 forms an abelian group with respect to the operation * given by $a * b = a + b + ab$ for all $a, b \quad \epsilon \quad G$

15) a) Show that the set $\{[1], [3], [4], [5], [9]\}$ forms an abelian group under multiplication modulo 11.

(OR)

b) Show that the set of all matrices of the form $\begin{pmatrix} a & 0 \\ 0 & 0 \end{pmatrix}, a \quad \epsilon \quad R-\{0\}$forms an abelian group under matrix multiplication.

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