

**F.Y.B.SC. (Computer Science) SEM –II (2014 COURSE) : WINTER -  
2018**

**SUBJECT : ALGEBRA – II**

Day : Wednesday  
Date : 17/10/2018

Time : 03.00 PM TO 05.00 PM  
Max. Marks : 40

**W-2018-0949**

**N.B.:**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.

**Q.1** Attempt **ANY TWO** of the following: [10]

- a) State and prove Reversal Law.
- b) Find order of every element in  $(\mathbb{Z}_6, +_6)$ .
- c) Show that  $G = \{1, -1, i, -i\}$  is cyclic group and find all its generators.

**Q.2** Attempt **ANY TWO** of the following: [10]

- a) Express the permutation  $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 2 & 5 & 4 & 3 & 6 & 1 & 7 & 9 & 8 \end{pmatrix}$  as product of disjoint cycles. Determine whether  $\sigma$  is even or odd. Find  $\sigma^{-1}$ .
- b) State and prove Lagrange's theorem.
- c) Show that the multiplicative group  $G = \{1, w, w^2\}$ , where  $w$  is complex cube root of unity is isomorphic to  $(\mathbb{Z}_3, +_3)$ .

**Q.3** Attempt **ANY TWO** of the following: [10]

- a) Prove that every subgroup of an abelian group is normal.
- b) Show that  $f : (C, +) \rightarrow (C, +)$  defined by  $f(z) = \bar{z}, \forall z \in C$  isomorphism.
- c) Write down factor group  $\frac{\mathbb{Z}_6}{\langle 2 \rangle}$ .

**Q.4** Attempt **ANY FIVE** of the following: [10]

- a) Prepare composition table for addition and multiplication for  $\mathbb{Z}_3$ .
- b) State Left Cancellation Law and Right Cancellation Law.
- c) Is union of two subgroups is subgroup? Justify.
- d) Define cyclic group.
- e) Let  $f = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 2 & 4 & 1 \end{pmatrix}$  and  $g = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \end{pmatrix}$ .  
Compute: i)  $f \circ g$                       ii)  $f^{-1} \circ g^{-1}$ .
- f) Define Integral Domain.
- g) Write down all odd permutations of  $S_3$ .

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