Score ☐ **Name:** ____________ **Roll No.** ____________

Quiz–Algebra I: M.Sc. (Hons.) Mathematics, Semester I
(October-2014✽)

Max. Marks 10 Max. time allowed: 20 Minutes

Note: Read the instructions carefully:
✽Attempt all questions by ticking ✓ *only* one of the four choices (a), (b), (c), and (d) for each question below.
✽Response to any question marked for more than one choice will not be counted for any score.

1. One of the following is *not* a composition series
   (a) $1 \trianglelefteq \langle \bar{3} \rangle \trianglelefteq \langle \bar{2} \rangle \trianglelefteq \mathbb{Z}/12\mathbb{Z}$ (b) $1 \trianglelefteq \langle r \mid r^7 = 1 \rangle \trianglelefteq D_{14}$
   (c) $1 \trianglelefteq \{1, (12)(34), (13)(24), (23)(14)\} \trianglelefteq A_4 \trianglelefteq S_4$ (d) none of these

2. The order of the element $x = \begin{pmatrix} 0 & i \\ i & 0 \end{pmatrix}$ of the group $GL_2(\mathbb{C})$ is
   (a) 4 (b) 1 (c) 2 (d) 8

3. Every group of order $n \in \mathbb{N}$ is abelian if and only if $n = \prod_{i=1}^{r} p_i \prod_{j=1}^{s} q_j^2$ where p_i and q_j are distinct primes which satisfy $\gcd(n, K) = 1$, where K is equal to
   (a) $\displaystyle\prod_{i=1}^{r} p_i \prod_{j=1}^{s} (q_j^2 - 1)$ (b) $\displaystyle\prod_{i=1}^{r} (p_i + 1) \prod_{j=1}^{s} (q_j^2 + 1)$
   (c) $\displaystyle\prod_{i=1}^{r} (p_i + 1) \prod_{j=1}^{s} (q_j^2 - 1)$ (d) $\displaystyle\prod_{i=1}^{r} (p_i - 1) \prod_{j=1}^{s} (q_j^2 - 1)$

4. Let m denotes the number of all homomorphisms from $D_6 \to \mathbb{Z}_6$ and n is the number of all homomorphisms from $\mathbb{Z}_6 \to D_6$. Then
   (a) $m < n$ (b) $m = n$ (c) $n < m$ (d) none of these.

5. Let G be a simple group of order 168. Then the number of subgroups of G of order 7 is
   (a) 1 (b) 7 (c) 8 (d) 24

6. Under the action of an abelian-group of order 24 on a set $X \neq \emptyset$, the number of elements in the distinct orbits has one of the following possibilities
   (a) 1,2,3,18 (b) 2,2,2,2,6,10 (c) 7,7,7,3 (d) 1,4,8,12

7. A group is finite abelian if and only if
   (a) it is cyclic (b) it is simple
   (c) it has a composition series (d) none of these

8. The total number of elements of order 2 in S_4 is
   (a) 1 (b) 3 (c) 9 (d) none of these

9. Let G be a finite group having elements of orders 1,2,...,and 9. The least possible order of such a group is
   (a) $9!$ (b) 2520 (c) 1 (d) $\dfrac{9!}{2}$

10. If $n \geq m$, then the number of $m-$cycles in the permutation group S_n is given by:
    (a) $\dfrac{n(n-1)\cdots(n-m+1)}{m}$ (b) $\dfrac{n(n-1)\cdots(n-m+1)}{2}$
    (c) $\dfrac{n(n-1)\cdots(n-m+1)}{n}$ (d) none of these

Checked by ____________

$5.c$
$1.a$
$3.b$
$4.b$
$7.c$
$8.c$
$2.c$
$9.b$
$10.a$
$6.b$