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Maximum Weight : 10

Section II

ME 010 101—MCQ—ABSTRACT ALGEBRA

[TO BE ATTACHED TO THE MAIN ANSWER-BOOK]

M.Sc. DEGREE (C.S.S.) PRIVATE EXAMINATION, MAY 2026

DO NOT WRITE YOUR REGISTER NUMBER OR NAME ANYWHERE IN SECTION II OF
THE QUESTION PAPER

Answer all questions.

All questions carry equal weight.

Put a tick mark [✓] against the correct answer.

1. Order of the element $(0, 0)$ in the group $\mathbb{Z}_2 \times \mathbb{Z}_4$:

(A) 1.

☐

(B) 2.

☐

(C) 3.

☐

(D) 4.

☐

2. Find the order of the factor group $\mathbb{Z}_6 / \langle 3 \rangle$:

(A) 2.

☐

(B) 3.

☐

(C) 4.

☐

(D) 6.

☐

3. Find the order of the given factor group $(\mathbb{Z}_3 \times \mathbb{Z}_5) / (\{0\} \times \mathbb{Z}_5)$:

(A) 5.

☐

(B) 2.

☐

(C) 7.

☐

(D) 3.

☐

4. If $\phi: \mathbb{Z}_{12} \rightarrow \mathbb{Z}_3$ be a homomorphism such that $\phi(1) = 2$. Then the Kernel of ϕ is :

(A) 0, 3, 6, 9.

☐

(B) 0, 6.

☐

(C) 0, 2, 4, 6, 8, 10.

☐

(D) None of the above.

☐

5. In $\mathbb{Z}_{24}$, let $H = \langle 4 \rangle$ and $N = \langle 6 \rangle$. Then, the elements in HN are :

(A) $\{0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22\}$.

☐

(B) $\{0, 4, 8, 12, 16, 20\}$.

☐

(C) $\{0, 8, 16\}$.

☐

(D) None of the above.

☐

Turn over





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6. A Sylow-p-subgroup of a finite group G is :

- (A) Abelian. ☐
- (B) Is unique if and only if it is normal in G . ☐
- (C) Is cyclic. ☐
- (D) None of the above. ☐

7. The statement "If H is a subgroup of G and N is a normal subgroup of G , then $(HN)/N \cong H/H \cap N$ is :

- (A) Second isomorphism theorem. ☐
- (B) Second Sylow theorem. ☐
- (C) Third isomorphism theorem. ☐
- (D) Third Sylow theorem. ☐

8. If G is a group of order 75, then :

- (A) G has subgroup of order 3 and 5. ☐
- (B) G has subgroup of order 3 but no subgroup of order 5. ☐
- (C) G has subgroup of order 5 but no subgroup of order 3. ☐
- (D) G need not have subgroups of order 3 and 5. ☐

9. Which of the following is not a field under addition and multiplication ?

- (A) $\mathbb{Z}$. ☐ (B) $\mathbb{R}$. ☐
- (C) $\mathbb{C}$. ☐ (D) $\mathbb{Q}$. ☐

10. Consider the evaluation homomorphism $\phi_2 : F[x] \rightarrow E$ where $F = E = \mathbb{C}$. Then $\phi_2(x^2 + 3)$ is :

- (A) 2. ☐ (B) 3. ☐
- (C) 1. ☐ (D) 7. ☐





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11. Consider the evaluation homomorphism $\varphi_3 : F[x] \rightarrow E$ where $F = E = Z_7$. Then

$\varphi_3 \left[(x^4 + 2x)(x^3 - 3x^2 + 3) \right]$ is :

(A) 8.

☐

(B) 4.

☐

(C) 6.

☐

(D) 2.

☐

12. Zeros of the polynomial $x^3 + 2x + 2$ in Z_7 :

(A) 5.

☐

(B) 2 and 3.

☐

(C) 2 and 6.

☐

(D) 6.

☐

13. A ring homomorphism $\varnothing : R \rightarrow R'$ is one-one if and only if :

(A) $\text{Ker}(\varnothing) = \{1\}$.☐(B) $\text{Ker}(\varnothing) = \{1, 2\}$.☐(C) $\text{Ker}(\varnothing) = \{0\}$.☐(D) $\text{Range}(\varnothing) = \{0\}$.☐

14. Let R be a commutative ring with unity of prime characteristic p . Then the map $\varnothing_p : R \rightarrow R$ defined by $\varnothing_p(a) = a^p$ is a homomorphism called _____.

(A) Projection homomorphism.

☐

(B) Group Homomorphism.

☐

(C) Ring Homomorphism.

☐

(D) Froebenius Homomorphism.

☐

15. An additive subgroup N of a ring R such that $aN \subseteq N$ and $Nb \subseteq N$ for every $a, b \in R$ is called _____.

(A) Factor ring.

☐

(B) Prime ideal.

☐

(C) Ideal.

☐

(D) Prime field.

☐

16. Which of the following is true :

(A) $M_n(F)$ has no divisors of zero for any n and any field F .☐(B) Every non-zero element of $M_2(Z_2)$ is a unit.☐(C) The group ring RG of an abelian group G is a commutative ring for any commutative ring R with unity.☐

(D) No subring of quaternions is a field.

☐**Turn over**



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17. Which of the following is false ?

- (A) An ideal M of R is maximal if and only if R/M is a field, for a commutative ring R . ☐
- (B) An ideal N of R is prime if and only if R/N is a integral domain, for a commutative ring R . ☐
- (C) Every maximal ideal of R need not be a prime ideal for a commutative ring R . ☐
- (D) Every maximal ideal of R is a prime ideal for a commutative ring R . ☐

18. Let H be a subring of the ring R . Multiplication of additive cosets defined by $(a + H)(b + H) = ab + H$ is well defined if and only if :

- (A) $ah \in H$ and $hb \in H, \forall a, b \in R$ and $h \in H$. ☐
- (B) $ah \in H$ and $hb \notin H, \forall a, b \in R$ and $h \in H$. ☐
- (C) Neither ah nor hb belongs to $H, \forall a, b \in R$ and $h \in H$. ☐
- (D) $ah \notin H$ and $hb \in H, \forall a, b \in R$ and $h \in H$. ☐

19. If R is a ring with unity and N is an ideal of R containing a unit, then :

- (A) $N \subset R$. ☐ (B) $N \neq R$. ☐
- (C) $N = R$. ☐ (D) $N \supset R$. ☐

20. Let $p(x)$ be an irreducible polynomial in $F[x]$. If $p(x)$ divides $r(x)s(x)$ for $r(x), s(x) \in F[x]$, then :

- (A) Neither $p(x) | r(x)$ nor $p(x) | s(x)$. ☐ (B) Either $p(x) | r(x)$ or $p(x) | s(x)$. ☐
- (C) $p(x) | r(x)$ and $p(x) | s(x)$. ☐ (D) All of the above are true. ☐

No. of MCQ's attempted

Weight Scored

(To be entered by the examiner)

No. of MCQ's not attempted

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