Avinashilingam Institute for Home Science and Higher Education for Women

Deemed to be University Estd. u/s 3 of UGC Act 1956, Category 'A' by MHRD (now MoE)
Re-accredited with an 'A++' Grade by NAAC CGPA 3.65/4, Category I by UGC
Coimbatore - 641 043, Tamil Nadu, India

Continuous Internal Assessment Test I– August2025

Semester V

Class :III UG **Time :2Hours**

Major : Mathematics **Max.Marks:60**

23BMAC10–Advanced Algebra

Course Outcomes:

CO1: understand the basic concepts of group actions anr their applications.
CO2 :recognize and use the Sylow theorems to characterize certain finite groups.
CO3 :know the fundamental concepts in ring theory such as the concepts of ideals, quotient rings, integral domains and fields.
CO4 :learn in detail about polynomial rings.
CO5 :grasp the fundamental properties of finite field extensions and classification of finite fields.

PARTA **6x1 = 6**

Choose the Correct Answer

1. For g in G and for x in X, $stab(x)$= CO1K2
   a.$x\ stab(x)\ x^{-1}$ b.$g\ stab(x)\ g^{-1}$ c.$x\ stab(x)$ d. $g\ stab(x)$

2. The cardinality of the orbit of x, $|G_x| =$ CO1K2
   a.$|G||x|$ b.$|G|$ c. $|G||stab(x)|$ d.$|G|/|x|$

3. For a group of order 72, any subgroup of order 8 is a _____. CO2K1
   a.Sylow 8-subgroup of G b.Sylow 9-subgroup of G
   c.Sylow 3-subgroup of G d. Sylow 2-subgroup of G

4. A Sylow p-subgroup of a finite group G is a normal subgroup of G if and only if it is ____. CO2K1
   a .the only Sylow p-subgroup of G b. any one of Sylow p-subgroup of G
   c. the largest Sylowp-subgroup of G d. the smallest Sylowp-subgroup of G

5. The set 2Z of even integers under ordinary addition and multiplication is a _____. CO3K1
   a. ring b. commutative ring c. ring with unity d. commutative ringwith unity

6. For the subring {0,2,4} of the ring Z_6, the unity is____. CO3K1
   a. 0 b. 1 c.2 d.4

Part B **3x6=18**

Answer ALL questions

7.a. State and prove structure theorem for orbits. CO1K3

(or)

7.b. State and prove orbit counting theorem CO1K3

8. a. Determine the number of normal subgroups of a group G of order 30. CO2K4

(or)

8. b. If G is a group of order pq, where p and q are primes, p<q and p does not divide q-1, then show that G is cyclic CO2K4

9. a. State and prove subring test. CO3K3

(or)

9. b. Prove that a finite integral domain is a field. CO3K3

Part C **3x12= 36**

Answer ALL questions

10 a. How many distinct necklaces of 8 beads can be made by stringing together beads of two colours? CO1K4

(or)

10. b. Prove that An is simple for n ≥ 5. CO1K4

11. a. State and prove Sylow's first theorem. CO2K3

(or)

11. b. State and prove Sylow's second theorem. CO2K4

12.a. State and prove (i) characteristic of a ring with unity CO3K3
(ii) characteristic of an integral domain.

(or)

12. b. State and prove existence of factor rings. CO3K4

Copies: 22