



UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program : Seventh Semester – Fall 2021

Roll No.

Paper: Ring Theory

Course Code: MATH-407

Time: 3 Hrs. Marks: 60

Q.1. Solve the following:

(6x5=30)

- (i) Show that the homomorphic image of a ring and kernel of homomorphism are itself rings.
- (ii) Find all associates of $2 + x - 3x^2$ in $Z[x]$.
- (iii) If R is integral domain then prove that $R[x]$ the polynomial ring over R is integral domain.
- (iv) Define the following term: matrix rings, divisor, units, associates, unique factorization domain.
- (v) Show that $x^3 - 2$ is irreducible polynomial of $Q(\sqrt{2})$.
- (vi) Differentiate between Algebraic and Transcendental elements.

Solve the following:

(3x10=30)

- Q.2** Let R be commutative ring prove that an ideal P of R is prime if and only if R/P is integral domain. Also prove that If R is integral domain then $R[x]$ the polynomial ring over R is integral domain.
- Q.3** Distinguish between Reducible and Irreducible polynomials. Prove that in a unique Factorization domain every reducible element is prime?
- Q.4** Prove that a polynomial of degree n over a field can have at most n -roots in any extension field.