

**North Gauhati College**  
**Sub: Mathematics**  
**Semester: 4 (Major)**  
**Paper: 4036(Ring Theory)**  
**Marks: 30**

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1. Answer the following questions: 6×5=30
- (a) Define a ring. Give an example with proper explanation.
  - (b) Prove that any finite non-zero integral domain is a field.
  - (c) Define a maximal ideal. If  $R$  is a commutative ring with unity and  $A$  is an ideal of  $R$ , then prove that  $\frac{R}{A}$  is a field if and only if  $A$  is a maximal ideal.
  - (d) Define ring isomorphism. State and prove the fundamental theorem of ring homomorphism.
  - (e) Define the following terms:
    - i. Euclidean Domain.
    - ii. Principal Ideal Domain.
    - iii. Ring of polynomials over a ring  $R$ , i.e.  $R[x]$ .
  - (f) If  $F$  is a field, then prove that  $F[x]$  is a principal ideal domain.