Q.1. Let *S* = {0, *a*, *b*, *c*}. The addition and multiplication on the set *S* is defined in the following tables:



Is S a ring? Justify your answer.

Q.2. Develop a set of tables that displays the output for addition and multiplication using modulo 5 for GF(5). Also find the additive and multiplicative inverse for all non zero elements in GF(5).

Q.3. For polynomial arithmetic with coefficients in Z11, perform the following calculations.

**a.** (7 *x* + 2) - (*x* 2 + 5)

**b.** (6*x* 2 + *x* + 3) (5 *x* 2 + 2)

Q.4. Determine whether the following polynomials are reducible over GF(2) or not.

**a.** *x* 3 + 1

**b.** *x* 3 + *x* 2 + 1

Q.5. using the Euclidean algorithm find the gcd for the following pair of numbers.

**a.** (24140, 16762)

**b.** (4655, 12075)

Q.6. Determine the gcd of the following pairs of polynomials.

**a.** (*x* 3 + *x* 2 + 1) and (*x*2 + *x* + 1) over GF(2)

**b.** (*x*3 - *x* + 1) and (*x*2 + 1) over GF(3)