Chapter 2:
Relations and Functions

Concept:

Cartesian products of sets – equality of ordered pairs- triple product- relations- functions- domain- range- different types of functions- algebra of functions.

Notes:

- If (a,b) = (c,d) then a = c and b = d.
- AxB = { (x,y) / x ϵ A, y ϵ B }
- AxAxA = { (x,y,z) / x, y, z ϵ A }
- A relation R is a subset of the Cartesian product.
- A function is a relation with every element of first set has one only one image in second set.
- The set of all first elements of the ordered pairs in a function is called domain.
- The set of all second elements of the ordered pairs in a function is called the range.
- Second set itself is known as co-domain.

Text book questions

Ex: 2.1	Questions: 1, 2*, 5*, 7*
Ex: 2.2	Questions: 1, 2, 6, 7*
Ex:2.3	Questions: 2*, 5*
Misc. Ex:	Questions: 3*, 4, 6, 8, 11, 12
Example	Question: 22*

Extra/HOT questions

1. Find x and y if $(x^2-3x, y^2-5y) = (-2, -6)$.
2. Draw he graph of the following functions:
   a) Modulus function in [-4, 4]
   b) Signum function in [-6, 6]
   c) Greatest integer function in [-3, 4]

3. Find the domain of the following functions:
   a) $f(x) = \frac{x^2-1}{x-1}$
   b) $f(x) = \frac{3x+1}{x^2-5x+6}$
   c) $f(x) = \frac{2x-3}{(x-1)(x+2)}$

4. Find the domain and range of the following functions:
   a) $f(x) = \frac{1}{9-x^2}$
   b) $f(x) = \sqrt{x^2-1}$
   c) $f(x) = \frac{1}{x^2+4}$
   d) $f(x) = \frac{|x|}{1+|x|}$
5. If $f(x) = x^2 + \frac{1}{x^2}$ then show that f(a) = f(1/a) and also evaluate f(3/2)-f(2/3)
6. Let R = {(x,y) / x, y ϵ N , x+2y = 13} then write R as an ordered pair and also find the domain and range.
7. Let A = {x / x is a natural number <12 } and R be a relation in A defined by (x,y) in R if x+y = 12, then write R.
8. A function f is defined on the set of natural numbers as

$$f(x) = \begin{cases} x^2 \; if \; 1 \leq x < 5 \\ x+3 \; if \; 5 < x \leq 8 \\ \frac{x-3}{2} \; if \; 8 < x \leq 11 \end{cases}$$

Write the function in roster form and also find the domain and range of the function.

9. Let A = {1,2,3,4}, B = {-1, 0, 1} and C = {3, 4} then verify the following:
   a) A X (B U C) = (A X B) U (A X C)
   b) A X (B-C) = (A X B) – (A X C)
   c) $A \; X \; (B \cap C) = (A \; X \; B) \cap (A \; X \; C)$
10. If A = {-3, -2, 0, 2, 3} write the subset B of A X A such that first element of B is either -3 or +3.