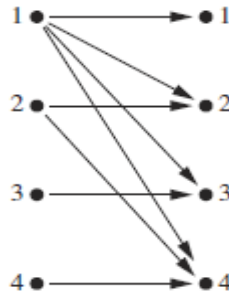Solutions

Tutorial Sheet-5

1. R = {(1, 1), (1, 2), (1, 3), (1, 4), (2, 2), (2, 4), (3, 3), (4, 4)}.

2. a) {(0, 0), (1, 1), (2, 2), (3, 3)}
    b) {(1, 3), (2, 2), (3, 1), (4, 0)}
    c) {(1, 0), (2, 0), (2, 1), (3, 0), (3, 1), (3, 2),(4, 0), (4, 1), (4, 2), (4, 3)}
    d) {(0, 1), (1, 1), (2, 1), (3, 1), (4,1), (0, 2), (2, 2), (4, 2), (0, 3), (3, 3)}
    e) {(0, 1), (1, 0), (1, 1),(1, 2), (1, 3), (2, 1), (2, 3), (3, 1), (3, 2), (4, 1), (4, 3)}
    f) {(1, 2), (2, 1), (2, 2)}

3. i) {(2,3),(3,2),(3,1)}
    ii) {(1,1),(2,2),(3,3),(4,4),(3,1),(1,2)}
    iii) {(1,1),(2,2),(3,3),(4,4),(3,2),(2,3)}

4. a) Transitive
    b) Reflexive, symmetric, transitive
    c) Symmetric
    d) Antisymmetric
    e) Reflexive, symmetric, antisymmetric, transitive
    f) None of these properties

5. a. {(1, 2), (2, 3), (3, 4), (1, 1), (2, 1), (2, 2), (3, 1), (3, 2), (3, 3)}
    b. {(1, 2), (2, 3), (3, 4)}
    c. null
    d. {(1, 1), (2, 1), (2, 2), (3, 1), (3, 2), (3, 3)}

6. {(1,1),(1,2),(2,1),(2,2)}

7. R1. null
   R2. {(0,0)}
   R3. {(0,1)}
   R4. {(1,0)}
   R5. {(1,1)}
   R6. {(0,0), (0,1)}
   R7. {(0,0), (1,0)}
   R8. {(0,0), (1,1)}
   R9. {(0,1), (1,0)}
   R10. {(0,1), (1,1)}
   R11. {(1,0), (1,1)}
   R12. {(0,0), (0,1), (1,0)}
   R13. {(0,0), (0,1), (1,1)}
   R14. {(0,0), (1,0), (1,1)}
   R15. {(0,1), (1,0), (1,1)}
   R16. {(0,0), (0,1), (1,0), (1,1)}

ii.

   reflexive: 8, 13, 14, 16
   Irreflexive: 1, 3, 4, 9
   Symmetric: 1, 2, 5, 8, 9, 12, 15, 16
   Antisymmetric: 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14
   Asymmetric: 1, 3, 4
   Transitive: 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14, 16

8. R^2=(1,2),(1,3),(1,4),(1,1),(1,5),(2,1),(2,4),(2,5),(2,2),(2,3),(3,1),(3,2),(3,3),(3,5),(3,4),(4,2),(4,3),(4,4),(4,1),(5,1),(5,2),(5,3),(5,4),(5,5)

   Same way, evaluate it for R^3, R^4 and R^5.