



b) Any 7 numbers are chosen from 1-12. Show that,

- i) Two of them will add to 13.
- ii) There are two relative prime integers.

c) Define the followings with example:

- i) Floor function
- ii) Ceilling function
- iii) Remainder function.

**Unit - II**

2. a) Let  $A = \{1, 2, 3, 4\}$  and  $R = \{(1, 3), (3, 2), (2, 4), (3, 1), (4, 1)\}$ . Find the transitive closure of R using Warshall's algorithm. (8)

b) Define the followings with example:

- i) Equivalence relation
- ii) Partial order relation
- iii) Total order relation
- iv) Cross partition of a set.

**OR**

2. a) Let R be a relation defined on a set of ordered pairs of positive integers such that for all  $(x, y), (u, v) \in Z^+ \times Z^+, (x, y) R (u, v)$  if and only if  $\frac{u}{x} = \frac{v}{y}$ . Determine whether R is an equivalence relation. (8)

b) Let  $A = \{1, 2, 3, 4\}$  and  $R = \{(a, b) : a + b > 4\}$  be a relation on A. Draw the graph of the relation R. (4)

c) Let R be an equivalence relation on a set of positive integers defined by  $x R y$  if and only if  $x = y \pmod{3}$ . Then, find the equivalence class of 2 and also find the partition generated by the equivalence relation. (4)

**Unit - III**

3. a) Let  $a_n = a_{n-1} + a_{n-2}$  for  $n \geq 3$  with the initial conditions  $a_1 = a_2 = 1$ , then prove that  $2^{n-1} a_n \equiv n \pmod{5}, \forall n \geq 1$  (4)

b) State and prove Euclidean Algorithm for integers. (8)

c) Use binary search algorithm to search the list  $X = \{3, 5, 8, 13, 21, 34, 55, 89\}$  for key=5 (4)

**OR**

3. a) Prove that  $7^{2n} + 2^{3n} - 3^{n-1}$  is divisible by 25 for all positive integers. (4)

b) State and prove Division Algorithm for integers. (8)

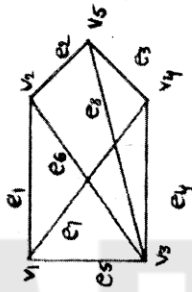
c) Use bubble sort to put 3, 2, 4, 1, 5 into searching order. (4)

**Unit - IV**

4. a) Define the followings with example:

- i) Complete graph
- ii) Bipartite graph
- iii) Complete Bipartite graph
- iv) Weighted graph

b) Define spanning tree in a graph. Find five spanning trees for the graph shown in figure and write the sets of branches and chords corresponding to these spanning trees. (8)



4. a) Apply a breadth-search algorithm to explore all the vertices from the vertex A of the graph given in figure and find the breadth-first search tree. (8)

