

- (b) State and explain the applications of the pigeon hole principle. [12+4]
4. (a) Prove that a non empty subset H of a group G is a subgroup of G iff
- $a, b \in H \Rightarrow ab \in H$;
 - $a \in H \Rightarrow a^{-1} \in H$.
- (b) The set of integers Z , is an abelian group under the composition defined by \oplus such that $a \oplus b = a + b + 1$ for $a, b \in Z$. Find
- the identity of (Z, \oplus) and
 - inverse of each element of Z . [10+6]
5. (a) How many different orders can 3 men and 3 women be seated in a row of 6 seats if all members of same sex are seated in adjacent seats
- (b) A new state flag is to be designed with 6 vertical stripes in yellow, white, blue and red. In how many ways can this be done so that no two adjacent stripes have the same color? [16]
6. (a) A bank pays 8 percent each year on money in saving accounts. Find recurrence relation for the amount of money in saving account that would have after n years if it follows the investment strategies of:
- Investing \$1000 and leaving it in the bank for n years.
 - Investing \$100 at the end of each year.
- (b) Solve $a_n - 2a_{n-1} - 3a_{n-2} = 5^n$, $n \geq 2$, given $a_0 = -2$, $a_1 = 1$. [8+8]
7. (a) Explain about the adjacency matrix representation of graphs. Illustrate with an example.
- (b) What are the advantages of adjacency matrix representation.
- (c) Explain the algorithm for breadth first search traversal of a graph. [5+3+8]
8. (a) Prove or disprove that the following two graphs are isomorphic. Figures 8a, 8a.

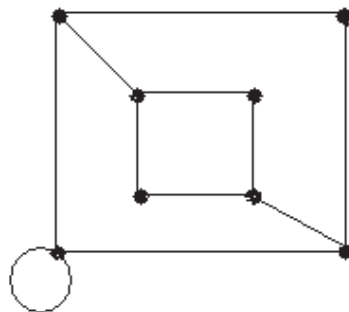


Figure 8a

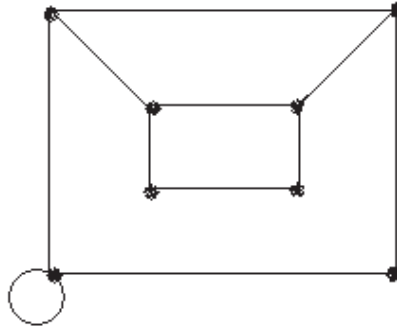


Figure 8a

(b) Determine the number of edges in

[8+8]

- i. Complete graph K_n ,
- ii. Complete bipartite graph $K_{m,n}$
- iii. Cycle graph C_n and
- iv. Path graph P_n .
