Program 12

Design and implement in java to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking Principle.

```
import java.util.Scanner;
public class P12{
     static int [] x = new int [25];
    static void Next_Vertex(int G[][],int n,int k)
    {
          int j;
          while(true)
          {
                    x[k]=(x[k]+1)%(n+1);
                    if(x[k]==0)
                              return;
                    if(G[x[k-1]][x[k]]!=0)
                    {
                              for(j=1;j<=k-1;j++)
                              {
                                        if(x[j]==x[k])
                                                  break;
                              }
                               if(j==k)
                              {
                                           if((k<n)||((k==n)&&(G[x[n]][x[1]]!=0)))
                                                   return;
                               }
                     }
           }
   }
   static void H_Cycle(int G[][],int n,int k)
   {
          int i;
          while(true)
          {
                    Next_Vertex(G,n,k);
                    if(x[k]==0)
                              return;
                    if(k==n)
                    {
                              System.out.println("\n");
                              for(i=1;i<=n;i++)
                                        System.out.print(x[i] +"-->");
                                        System.out.print(x[1]);
                    }
                    else
                              H_Cycle(G,n,k+1);
          }
     }
     public static void main(String[] args) {
                    int i,j,n;
                    int [][] G = new int [25][25];
                    Scanner read = new Scanner(System.in);
                    System.out.println("Enter the number of vertices of the graph");
```

```
                n=read.nextInt();
                System.out.println("Enter the Path adjacency matrix");

                for(i=1;i<=n;i++)
                {
                        for(j=1;j<=n;j++)
                        {
                                G[i][j]=read.nextInt();
                                x[i]=0;
                        }
                }

                x[1]=1;
           System.out.println(" \n Hamiltonian Cycles are");

                H_Cycle(G,n,2);
        }
}
```