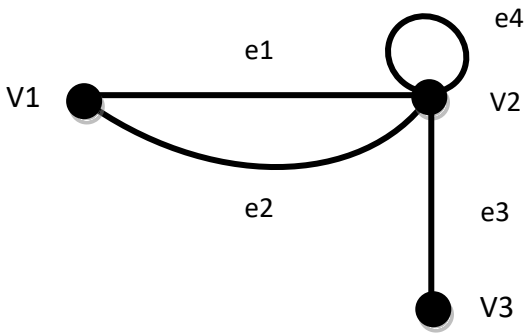
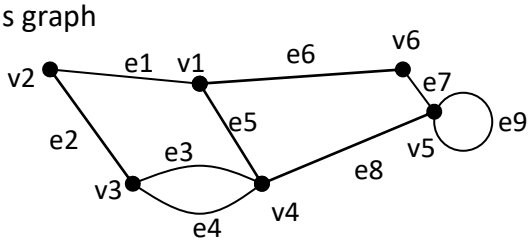
HW 3 Graph

1. Draw Picture of the specified graph. Graph G has vertex set { v1,v2,v3,v4,v5} and edge set {e1,e2,e3,e4} with edge-endpoint function as follows:

Edge	Endpoints
e1	{v1,v2}
e2	{v1,v2}
e3	{v2,v3}
e4	{v2}



2. For this graph



a) Find all edges that are incident on v1 e1,e5,e6 .

b) Find all vertices that are adjacent to v3 V2,V4 .

c) Find all loops e9 .

d) Find all isolated point V7 .

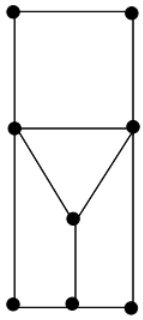
e) Find the degree of v4 4 .

f) Find the total degree of the graph 18 .

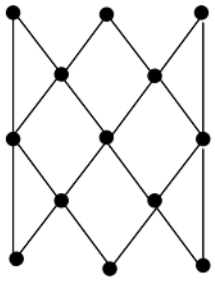
3. Construct a precedence graph for the following program:
   S1: x:=0
   S2: x:=x+1
   S3: y:=2
   S4: z:=y
   S5: x:=x+2
   S6: y:=x+z
   S7: z:=4

Ans:
x = 3 , y= 5 , z= 4 .

4. For each of the following graphs determine:



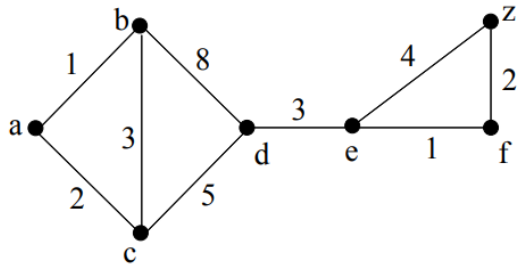
(i) Whether or not the graph has an Euler Circuit.
No .
(ii) Whether or not the graph has an Euler Path.
Yes .
(iii) Whether or not the graph has a Hamilton Circuit.
No .
(iv) Whether or not the graph has a Hamilton Path.
Yes .

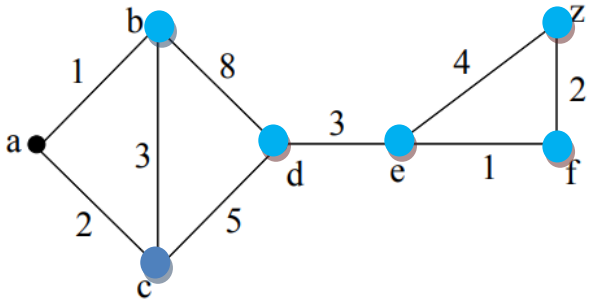


(i) Whether or not the graph has an Euler Circuit.
Yes .
(ii) Whether or not the graph has an Euler Path.
No .
(iii) Whether or not the graph has a Hamilton Circuit.
No .
(iv) Whether or not the graph has a Hamilton Path.
Yes .

5. For each of the following weighted graphs, use Dijkstra's Algorithm to find a shortest path from a to z.

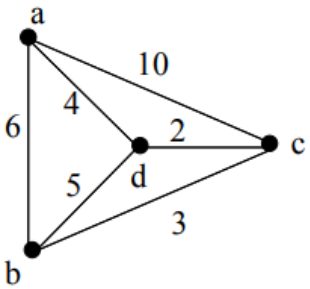
Output





The shortest path has weight: 13 and follows the vertex sequence sequence < a,c,d,e,f,z >.

6. Use a brute force algorithm to find an optimal solution for the **traveling salesman problem** for the given graph starting at "home" vertex a:

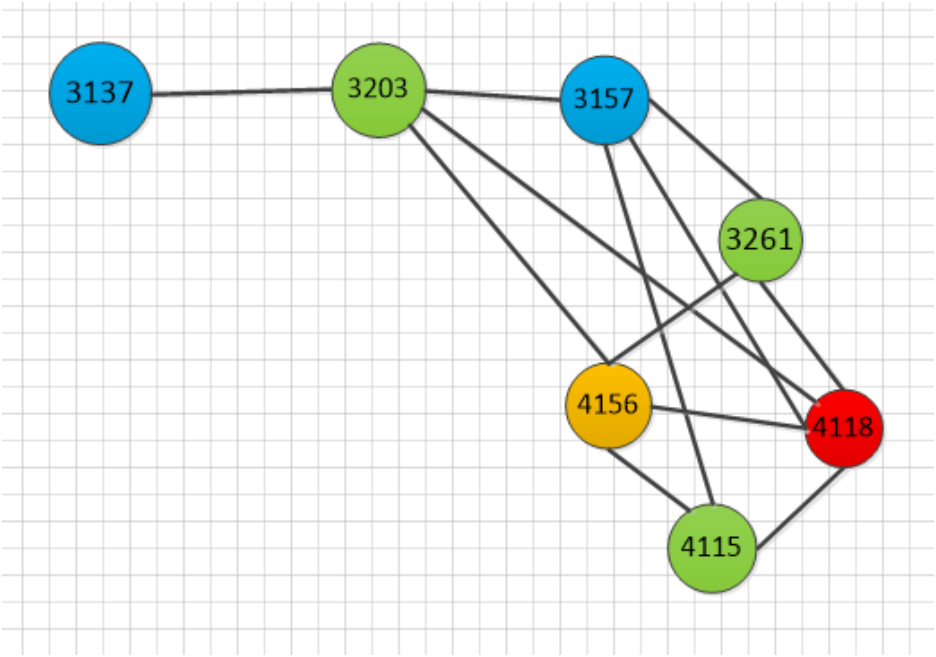


Possible Path	Total Weight
a,c,d,b,a	23
a,d,c,b,a	15
a,b,d,c,a	23
a,b,c,d,a	15
a,d,b,c,a	22
a,c,b,d,a	22

The minimal circuits starting at a are a,d,c,b,a and a,b,c,d,a,

which both have total weight 15.

7. **Graph Coloring**. Suppose want to schedule some final exams for CS courses with following course numbers: 1007, 3137, 3157, 3203, 3261, 4115, 4118, 4156
Suppose also that **there are no students in common taking the following pairs of** courses: 1007-3137 1007-3157, 3137-3157 1007-3203 1007-3261, 3137-3261, 3203-3261 1007-4115, 3137-4115, 3203-4115, 3261-4115 1007-4118, 3137-4118 1007-4156, 3137-4156, 3157-4156
How many exam slots are necessary to schedule exams?



8. An arbitrary number of colors may be needed if regions are not contiguous.
This example needs 4 color.