Week 8

1) What is the number of colors required to color a complete graph containing n vertices?

A. 3
B. 4
C. $\frac{n\cdot(n-1)}{2}$
D. n

Correct Answer: D

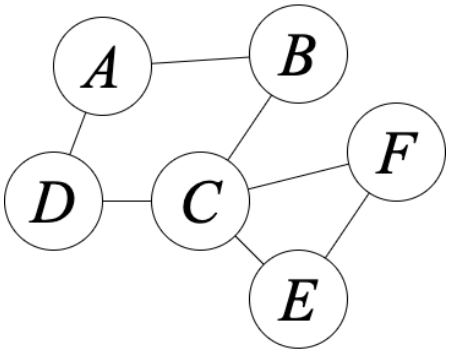
Solution: A complete graph having n nodes, requires n colors to be properly colored.

Lecture 343: Examples on Proper coloring.

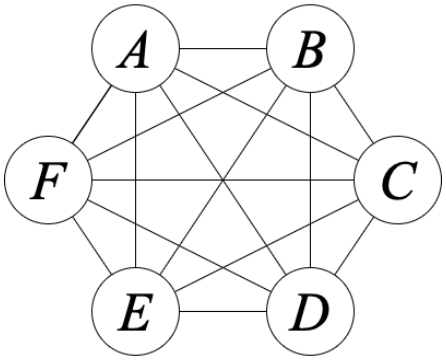
2) Which of the following graphs does not have an Eulerian circuit?

A. A complete graph with 79 vertices

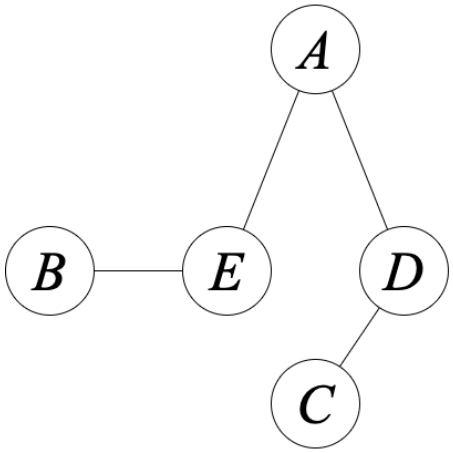
B.



C.



D. Complement of the graph



Correct Answer: C D

Solution: For a graph to be Eulerian, check whether all the nodes have even degree, if yes, then the graph is Eulerian, here the graph mentioned in option C and option D has nodes with odd degrees, hence they are not Eulerian.

Lecture 311: Litmus test for an Eulerian graph.

3) What is the number of edges for a connected planar graph having 8 vertices, and 6 regions?

A. 12
B. 14
C. 8
D. 10

Correct Answer: A

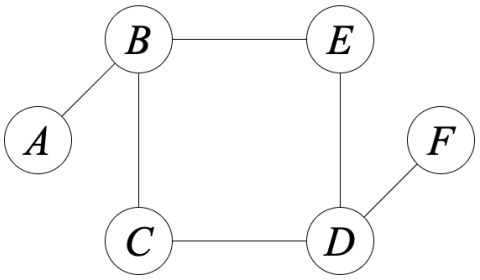
Solution: For a connected planar graph V – E + R = 2 is true,

Hence, E = V + R – 2, E = 8 + 6 – 2, E = 12, therefore number of edges equals to 12.

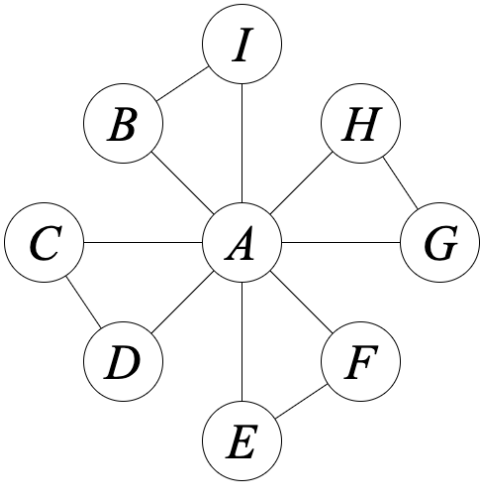
Lecture 332: Illustration of V – E + R = 2

4) Which of the following graphs can be concluded to be Hamiltonian?

A. A graph with the number of edges of every node, greater than $\frac{n}{2}$.



B.



C.

D. k_6

Correct Answer: A D

Solution: A graph where we can traverse through all the vertices, without repeating edges or vertices more than once is a Hamiltonian graph, also for a graph with the number of edges of every node, greater than $\frac{n}{2}$, we can conclude that the graph has a Hamiltonian graph.k_6 is a complete graph, hence it is a Hamiltonian graph.

Lecture 317: Definition of Hamiltonian graphs.

5) Find the total number of edges in the complement graph G_c, where G has 12 vertices and 34 edges.

A. 66
B. 32
C. 33
D. 34

Correct Answer: B

Solution: In the above-mentioned graph, the number of vertices in the graph G is 12, (n = 12), while number of edges, $|E(G)| = 34$.

We know that the sum of the number of edges in a graph and its complement is equal to number of edges in the complete graph.

So, $|E(G)| + |E(G^c)| = \frac{n\cdot(n-1)}{2}$

$$\frac{n \cdot (n-1)}{2} = \frac{12 \cdot 11}{2} = \frac{132}{2} = 66$$

Therefore, $34 + |E(G)| = 66$, $|E(G)| = 32$.

Lecture 300: Complement of a graph Illustration

6) Which of the following statement(s) is/are true?

I) We can find a tree that is not planar.
II) We can conclude that a graph is connected if the degree of all the vertices is greater than equal to $\frac{n}{2}$.
III) Given a graph G, there is a cycle of length k and k is less than equal to n, then we can find a path of length at least $k + 1$.

A. Only I
B. Only III
C. I and II

D. II and III
E. I II and III

Correct Answer: D

Solution: Any tree is a planar graph; hence we cannot find a tree that is not planar.

Lecture 321, 330: A result on path, Examples of Planar graphs.

7) A graph where we can traverse through all the vertices, without repeating edges or vertices more than once is called?

A. Planar graph
B. Complete graph
C. Hamiltonian graph
D. Eulerian graph

Correct Answer: C

Solution: A graph where we can traverse through all the vertices, without repeating edges or vertices more than once is a Hamiltonian graph.

Lecture 317: Definition of Hamiltonian graphs.

8) State whether true/false:

A bipartite graph can have an odd cycle.

A. True
B. False

Correct Answer: B

Solution: A bipartite graph cannot have an odd cycle.

Lecture 306: Bipartite graphs A puzzle.

9) What is the cardinality of the set of edges of the complement of a complete graph G having 5 vertices?

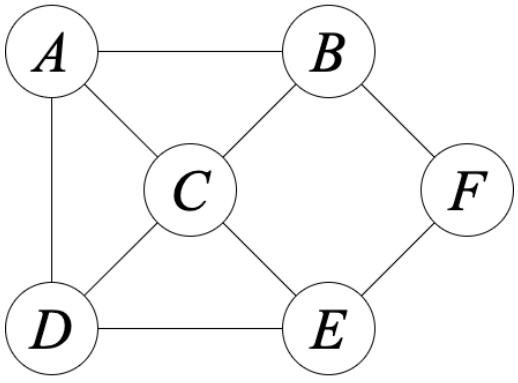
A. 10
B. 5
C. 0
D. 2

Correct Answer: C

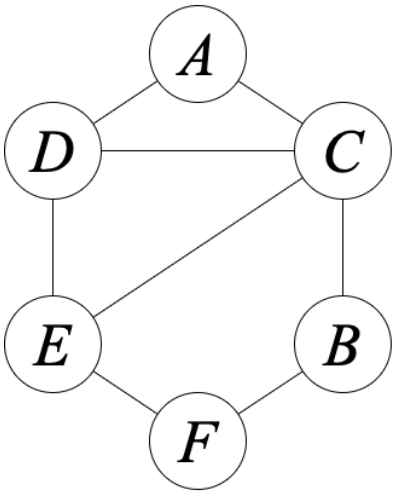
Solution: A complete graph consists of all possible edges for a graph, so in the complement of the graph, there will be no edges, hence the cardinality of the set of edges in the complement of a complete graph is zero.

Lecture 300: Complement of a graph Illustration

10) What is the chromatic number of the graph given below respectively?



I)

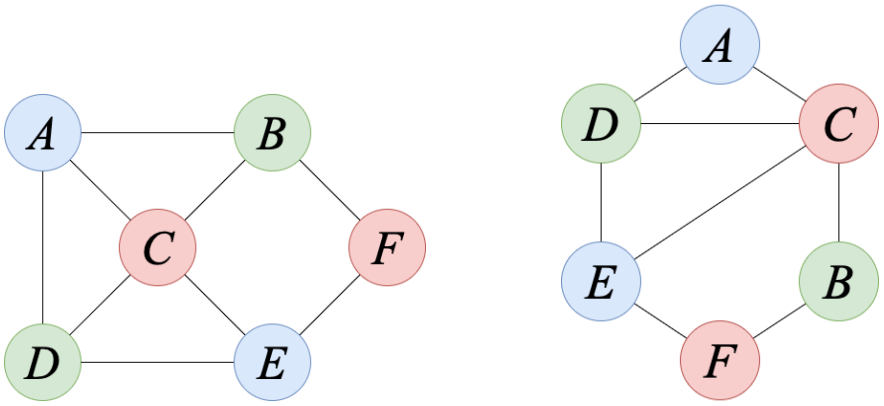


II)

A. 4,3
B. 4,4
C. 2,3
D. 3,3

Correct Answer: D

Solution: Here we can observe that, both the graphs can be colored using only 3 colors, hence the chromatic number of both the graph is 3.



Lecture 342: Chromatic number of a graph.