

## Handling Datasets

Social Networks - July 2020

MCQ Assignment - Week 2

1. Which of the following degree sequences is **not** possible for any graph to have? (Degree sequence of a graph is the list of degree of all the vertices of a graph)
- A. (2, 2, 2, 2, 2, 2)
  - B. (4, 4, 4, 4, 4, 4)
  - C. (2, 2, 2, 3, 3, 3)
  - D. (1, 2, 3, 3, 4, 5)

**ANSWER: C**

By hand-shaking lemma, the sum of degrees of all vertices must be even. For (C), it is 15.

2. What is the density of the graph  $G$  (Figure 1)?

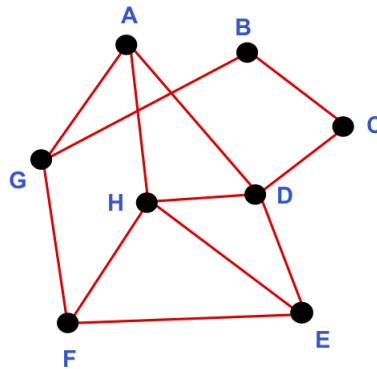


Figure 1: Graph  $G$

- A.  $3/7$
- B.  $12/64$
- C.  $12/8$
- D. 1

**ANSWER: A**

Density is the ratio of total edges to the total possible edges. Here,  $\frac{12}{8C2} = \frac{3}{7}$

3. Let the given four real-world networks be (as defined in the videos)
- A. Ingredients network
  - B. Friendship network
  - C. Web graph
  - D. Synonym network

Choose the correct option.

- A. Only (A) is undirected.
- B. Only (A) and (B) are undirected.
- C. Only (C) is directed.
- D. All of them are undirected.

**ANSWER: C**

Only Web graph is a directed network.

4. Let  $G(V, E)$  be an undirected graph without loops and let  $den(G)$  denote the density of the graph  $G$  and  $cc(v)$  denote the clustering co-efficient of a vertex  $v \in V$ . Which among the following is necessarily true:

- I: If  $cc(v) = 1$  for every vertex  $v \in V$ , then  $den(G) = 1$ .
- II: If  $den(G) = 1$ , then  $cc(v) = 1$  for every vertex  $v \in V$ .

- A. Only (I) is true.
- B. Only (II) is true.
- C. Both (I) and (II) are true.
- D. Both (I) and (II) are false.

**ANSWER: C**

If  $den(G) = 1$ , then  $G$  must be a complete graph. In a complete graph  $cc(v) = 1$  for every vertex  $v \in V$ . Hence statement (A) is true. The converse is also true.

5. Which of the following is **not** used as an extension for a network data set?

- A. .ogg
- B. .net
- C. .txt
- D. .csv

**ANSWER: A**

.NET extension is used for graphs in Pajek format; .txt is used for edgelist or adjlst formats; .GDF is a format for graphs which is similar to CSV format. However, .ogg is a format for videos, and not for networks.

6. Assuming Synonymy network of English language is undirected, we can traverse from the word 'SAD' to 'HAPPY' necessarily because:

- A. the Synonymy network is complete.
- B. the underlying network is connected.
- C. there is an edge between them.
- D. I have taken this course and I am happy.

**ANSWER: B**

If the network is connected, then from any node to any other node there exists a path.

7. Diameter of the complete graph on 7 vertices is:

- A. 7
- B. 5
- C. 1
- D. 3.5

**ANSWER: C**

Diameter is the maximum of all the shortest path lengths in the graph. For any pair of vertices, the length of shortest paths is one, in complete graphs. Hence Diameter is 1.

8. Degree distribution of most real-world networks follows which law?

- A. Benford's law
- B. Stefan's law
- C. Power law
- D. Zipf's law

**ANSWER: C**

Degree distribution of most real-world networks follows power law, which means there are very few nodes with very high degrees and there are a lot of nodes with very less degrees.

9. What is the maximum value a diameter can have for a connected graph with  $n$  vertices?

- A. 1
- B.  $n - 1$
- C.  $n$
- D.  $\infty$

**ANSWER: B**

The graph will be a path graph whose diameter will be  $n - 1$ .

10. True or False: Any undirected graph must have even number of vertices of odd degree.

- A. True
- B. False

**ANSWER: A**

This easily follows from the hand shaking lemma.