

Week 1 : Assignment

Assignment not submitted

1) Which function will you use to find the number of edges drawn in the Graph?

- order()
- edges()
- edge_size()
- number_of_edges()

2) What will be the maximum number of edges for a graph with 10 vertices?

- 10
- 45
- 55
- 100

3) What does items() function for a dictionary return?

- Dictionary with all keys and values
- List with tuples having keys and values
- List containing all keys and values
- Tuples containing all keys and values

45

55

100

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- Tuples containing all keys and values

4) What will be the output of the given code?

```
x=[i for i in range(10)]
plt.plot(x,x**2,'r')
plt.show()
```

- Error displaying unsupported operand types for ** in plot
- It plots the x with its exponential value with points and lines in the plot
- It plots x with exponential value with points in the plot
- It plots x with exponential value with red line in the plot

5) What does the value 'ys-' as the third parameter in plot function indicate?

- It helps to plot square with line connecting the points
- It helps to plot yellow color square with dotted line connecting the points

8) If you want to generate a random number from an inclusive range which function is to be used?

- randrange()
- randint()
- random.random()
- rand_int()

9) If a='Social', b='Networks' then which of the following operation would show 'SocialNetworks' as output?

- a+b
- a+"+b
- a+""+b
- All of the above

10) In the command networkx.erdos_renyi_graph(a,b), the parameters 'a' and 'b' denote the following respectively:

- Number of edges and the probability with which edges are to be placed between every pair of nodes
- Number of nodes and the probability with which edges are to be placed between every pair of nodes
- The probability with which edges are to be placed between every pair of nodes and Number of edges
- Number of edges and Number of nodes

You may submit any number of times before the due date. The final submission will be considered for grading.

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- randint()
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- $a+"+b$
- $a+""+b$
- All of the above

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- Number of nodes and the probability with which edges are to be placed between every pair of nodes
- The probability with which edges are to be placed between every pair of nodes and Number of edges
- Number of edges and Number of nodes

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Week 2 : Assignment

Assignment not submitted

1) Find the diameter for the given graph G in Figure 1

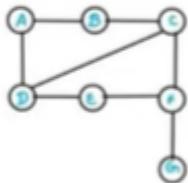


Figure 1: Graph G

- 3
- 4
- 5
- 6

2) Which of the following networks is a directed graph?

- followers on instagram account
- facebook friendship network
- collaboration network
- ingredients network

1 point

3) What will be the range of clustering coefficient for any vertex in undirected graph with no loop and multiple edges?

1 point

- 0 to 1
- 0 to infinity
- infinity to infinity
- 1 to +1

4) Key tag in GraphML is used to assign

1 point

- Node only
- Edge only
- Both node and edge
- loop

5) Expand GEXF.

- Graphical Extension XML Format
- Graphx Extension XML Format
- Graph Exchange XML Format
- Graph Extend Exchange Format

6) Compute density of the given graph.

1 point

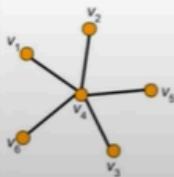


Figure 2: Graph H

- 0
- 1/2
- 1/3
- 1/4

1 point

6) Compute density of the given graph.

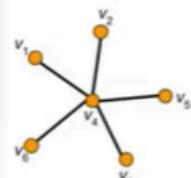


Figure 2: Graph H

- 0
- 1/2
- 1/3
- 1/4

7) For the given graph H in Question 6, If $A = \frac{\text{highdegree}}{\sum \text{degree}}$, what will be the value of A?

- 1
- 1/2
- 1/5
- 2/5

8) Choose the data set format which starts with the keyword "graph".

1 point

- GML
- Graph Exchange XML
- txt
- GEXF

9) The degree distribution of most real-world networks follows which law?

1 point

- Zipf's Law
- Benford's Law
- Power Law
- Difficult to say; can follow any distribution

Coding O' Clock

1 point



1 point

Coding O' Clc

1 point

Counting 0/0

- 10) Pick out the clustering coefficient for Node A in the given graph K.

1 point

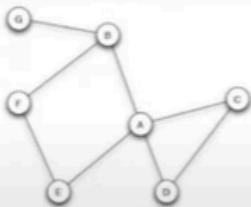


Figure 3: Graph K

- 1/6
- 3/4
- 1/3
- 1/2

You may submit any number of times before the due date. The final submission will be considered for grading.

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Week 3 : Assignment

Assignment not submitted

Due date: 2023-08-16, 23:59 IST.

- 1) Given each node in the following Figure 4 represents an individual, a solid line between the nodes represents the existing friendship and the dotted line represents the formation of a new friendship. Which of the following is the reason for such a friendship? 1 point



Figure 4: A

- Triadic Closure
- Membership closure
- Focal closure
- selection closure

- 2) Choose the correct statement. 1 point

- Clustering Coefficient denotes the probability of two nodes to become friends with each other
- Triadic Closure phenomenon is rare in all kinds of networks
- There is no likelihood for a person to become friend in future if he is not a friend in the present
- Acquaintances lead to strong ties

- 3) In Girvan Newman Algorithm, Edge G-H get removed after D-E what does this imply? 1 point

- G-H has high betweenness than D-E
- D-E has high betweenness than G-H
- G-H has more shortest paths
- Both edge are of same betweenness

- 4) Let us consider Node A has strong tie with B and C. Violation of strong Triadic closure takes place when there is ----- edge between two neighbours. 1 point

- One
- No
- One strong
- One weak

- 5) Which edge will be removed first based on Girvan Newman method?

1 point

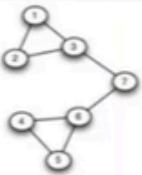


Figure 5: Graph H

- 3-7
 - 4-5
 - 4-6
 - 1-2

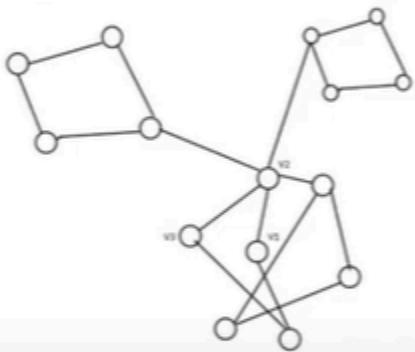
- 6) The measure of betweenness centrality is based on the

1 point

- longest path through node
 - shortest path through node
 - longest path between node and high degree node
 - shortest path between node and high degree node

- 7) What role/property of social networks is at display here in network K?

- I. Structural hole
 - II. V2 monopolises
 - III. Brokerage



- I and II only
 - II and III only
 - I and III only
 - I, II and III

- 9) Consider two nodes with D and O set of friends each. The equation $|D \cap O| / |D \cup O|$ describes the

- 8) Consider two nodes with P and Q set of friends each, the equation $|P \cap Q|/|P \cup Q|$ describes the

1 point

- Clustering coefficient
 - Social Capital
 - Neighbourhood Overlap
 - Centrality Measure

- 9) Given that neighbourhood overlap of an edge m is equal to 0. Then m is

1 point

- a strong tie
 - a local bridge
 - edge with high betweenness
 - a triad

10) What is the embeddedness between the nodes v_0 and v_2 in the given friendship network?

1 point

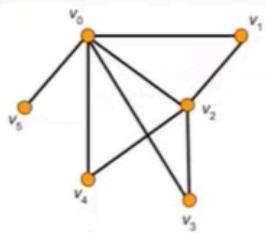


Figure 6: Friendship Network

- 0
- 1
- 2
- 3

You may submit any number of times before the due date. The final submission will be considered for grading.

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Week 4 : Assignment 1

Assignment not submitted

Due date: 2023-02-22, 23:59 IST.

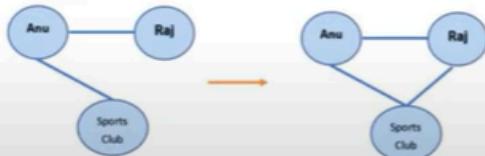
1 point

1) Identify the type of Homophily in the following LinkedIn recommendation:
"People with similar interests are following —."

- Selection
- Social Influence
- Membership closure
- Foci Closure

2) Identify the network mechanism in play for the following transformation.

1 point



- Triadic closure
- Focal Closure
- Membership closure
- Neighborhood overlap

3) Two friends Raj and Nila have taken different courses according to their interests. Raj has completed 12 courses and Nila has completed 16 courses in all. There are 7 courses that Raj and Nila have taken up in common. What is the similarity measure for Raj and Nila?

1 point

- 1/3
- 7/28
- 3
- 28/7

4) Suppose Manisha and Simran have a common friend with an independent probability p . What is the probability that they do not have k common friends?

1 point

- $p \times k$
-
- p^k
- $(1 - p)^k$
- $(1 - (1 - p))^k$

5) What are the factors that influence the dynamics of friendships formation and behaviour of people in a network?

1 point

- Social Influence
- Selection
- Both Social Influence and Selection
- Neither Social Influence nor Selection

6) In the fatman evolutionary model, what is the role of social foci?

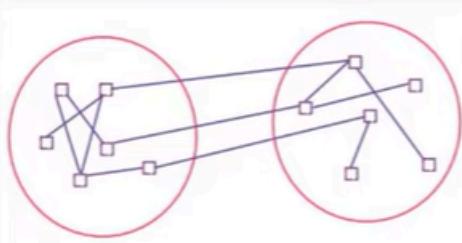
1 point

- Selection
- Social Influence
- Both Social Influence and Selection
-



7) Compute Homophily for the given network.

1 point



- 1
- 3/4
- 1/2
- 1/4

8) What is the relationship that exists between the probability of any two persons(A and B) being friends with respect to the number of their common friends?

1 point

- inverse
- linear
- polynomial
- exponential

- exponential

9) A network having inter-community edge density and intra-community edge sparsity will definitely exhibit

1 point

- Triadic closure
- Selection
- Homophily
- Heterophily



10) Assume there are 20 participants who have just enrolled for a workshop. Which of the following closure happen in this current state?

1 point

- Triadic closure
- Membership closure
- Focal closure
- None

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Week 5 : Assignment 1

Assignment not submitted

Due date: 2023-03-01, 23:59 IST.

- 1) Which of the following is an invalid value for the two dimensional Schelling model grid?

1 point

- 1
- 2
- 4
- 9

- 2) Given a triangular network with two positive relationships, When is the network stable?

1 point

- Never
- Sometimes
- Always
- cannot be inferred

- 3) Given the two dimensional grid in Figure 1, comment on the stability of the node in the center for A and B, given threshold t=2.

1 point



Figure 1: Schelling's model

- unstable, unstable
- unstable, stable
- stable, unstable
- stable, stable

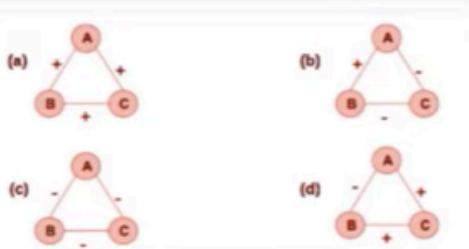
- 4) For a graph with five nodes, what is the maximum number of possible triangles in it?

1 point

- 10
- 20
- 30
- 40

- 5) Which of the following triangles are unstable?

1 point



- a and b
- b and c
- c and d
- a and d

- 6) Can we have a complete signed graph on 4 nodes (K4) and 5 nodes (K5) respectively, each having exactly one unstable triangle respectively? 1 point

- No, No
- No, Yes
- Yes, No
- Yes, Yes

7) Select all that is True for a structurally balanced network according to the Balance theorem?

1 point

- It can be a network with all positive relationships
- It can be a network of two clusters with all positive relationships across and all negative relationships within cluster
- It can be a network of two clusters with all positive relationships within and all negative relationships across cluster
- It can be a network with all negative relationships

8) Given an unstable triangle with edges $(+, +, -)$, this tends to become stable by transforming to a stable state. Which one of the following is an invalid option for such a stable state? 1 point

- $(+, +, +)$
- $(+, -, -)$
- $(-, -, +)$
- $(-, -, -)$

9) A friend's friend tends to become a friend, and so does an enemy's enemy. Pick out the reason(s). 1 point

- Triadic closure
- Structural balance
- Social influence
- Selection

10) When is a signed triangle said to be unstable? 1 point

- zero positive edge
- one positive edge
- two positive edges
- all positive edges

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Week 7 : Assignment 1

Assignment not submitted

Due date: 2023-03-16, 23:59 IST.

1) If the payoff of playing a game and working out in the Gym is given as 0.6 and 0.4 respectively. Four of your friends decides to play and five of them decide to work out. Which one should you pick? 1 point

- Playing a Game
- Work out in the Gym
- Data insufficient to decide
- None

2) Which of the following technique helps to identify the important node in the network so that the idea spreads to the entire network very fast? 1 point

- Community detection
- Page ranking
- Viral marketing
- Embeddedness

3) Consider a network with adoption threshold ' q '. A cascade cannot be complete in this network if there exists a cluster of density 1 point

- less than q
- less than $1-q$
- greater than q
- greater than $1-q$

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4) Find the density of Community c1, c2 and c3 for the following network.

1 point

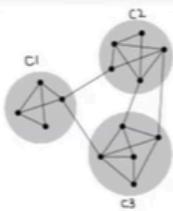


Figure 1: Graph G with communities c1, c2 and c3

- 5/6, 7/10, 8/10
- 5/30, 7/30, 8/30
- 4/6, 6/10, 7/10
- 4/30, 7/30, 8/30

5) Consider the graph G in Figure 1, which one of the communities is difficult for an idea to be injected?

- c1
- c2
- c3
- None

6) Any cascade on a complete network with only one seed node

1 point

- will always be complete
- will always be incomplete
- is difficult to occur
- Can't say - insufficient information

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1 point

- will always be complete
- will always be incomplete
- is difficult to occur
- Can't say - insufficient information

7) What is the cluster density of the each of the four node cluster?

1 point



Figure 2: Network with three four node clusters

- 1/3
- 2/3
- 3/4
- 4/3

8) Consider the network given in the following figure. Initially all the nodes in the network adopt an idea Y. Nodes A and B adopt a new idea X in the network. The payoff for X is 4 and Y is 1. This leads to a cascade in the network. What are all the nodes that have adopted the behavior A when the cascade ends?



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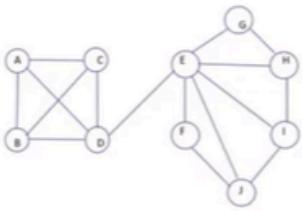
1 point

1 point

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- 8) Consider the network given in the following figure. Initially all the nodes in the network adopt an idea Y. Nodes A and B adopt a new idea X in the **1 point** network. The payoff for X is 4 and Y is 1. This leads to a cascade in the network. What are all the nodes that have adopted the behavior A when the cascade ends?



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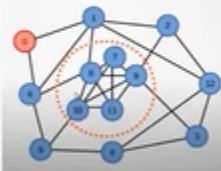
Figure 3: Cascade in action

- A, B, C
- A, B, C, D
- A, B, C, D, E
- A, B, C, D, E, F
- A, B, C, D, E, F, G, H, I, J

- 9) Consider a network where all of its nodes have adopted an idea A. Which of the following efforts can be a valid attempt to create a complete **1 point** cascade of a new idea B in such a network. Select all that is applicable.

- Increase the payoff for the new idea
- Identify key people in the network to inject the idea
- Increase the payoff for idea A
- Identify the cluster with density q

- 10) Given the network K, assume a new idea has been adopted by the nodes 0, 1, 2, 3, 4, and 5. How do you ensure that the new idea diffuses into **1 point** the cluster marked by red dotted lines?



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- by diffusing it to the nodes 6 and 12
- by identifying the correct set of nodes from outside the cluster
- Both
- Cascade is incomplete and it cannot enter the cluster

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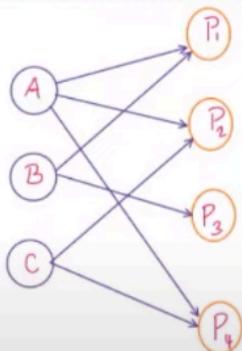
Week 8 : Assignment 1

Assignment not submitted

Due date: 2023-03-22, 23:59 IST.

- 1) Consider the following graph G. What is the formula used to apply the principle of repeated improvement before normalisation to obtain convergence?

1 point

SUB
FOR

- 1) Consider the following graph G. What is the formula used to apply the principle of repeated improvement before normalisation to obtain convergence?

1 point

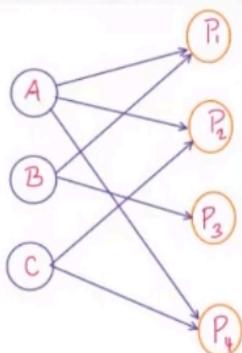
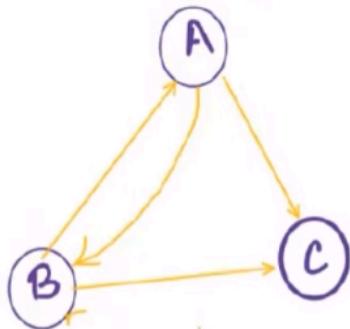
SUB
FOR

Figure 1: Graph G

- A = P1 + P2 + P4, B = P1 + P3, C = P2 + P4, P1 = A + B, P2 = A + C, P3 = B, P4 = A + C
- A = P1 + P3 + P4, B = P1 + P3, C = P2 + P4, P1 = A + B, P2 = A + C, P3 = B, P4 = A + C
- A = P1 + P2 + P4, B = P1 + P3, C = P2 + P4, P1 = A + B, P2 = A + C, P3 = B, P4 = A + B
- A = P1 + P2 + P3, B = P1 + P3, C = P2 + P4, P1 = A + B, P2 = A + C, P3 = B, P4 = A + C

- 2) For the given network H, what will happen after say 10 iterations of Page rank updates for the initial value of 1/3 for every node in the network 1 point



**SUB
FOR**

Figure 2: Graph H

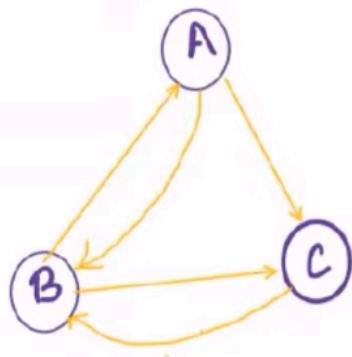
- The value at A steadily increases
- The value at C steadily decreases
- The value at C steadily increases
- The value at B steadily increases

- 3) Consider a Graph H shown in figure 2. Which of the following is True for this graph? 1 point

- Doesnot converge
- Converges with all points in node C
- Converges zero points in node C
- Converges with maximum points in A and B

- 4) Pick out the matrix that represents the given graph J to view page rank as a matrix multiplication process: 1 point

For the media that represents the given graph to view page rank as a matrix multiplication process.



**SUB
FOR**

Figure 3: Graph J

- $\begin{bmatrix} 0 & 1/2 & 0 \\ 0 & 0 & 1 \\ 1 & 1/2 & 0 \end{bmatrix}$
- $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$
- $\begin{bmatrix} 0 & 1/2 & 0 \\ 1/2 & 0 & 1 \\ 1 & 1/2 & 0 \end{bmatrix}$
- $\begin{bmatrix} 0 & 1/2 & 0 \\ 0 & 0 & 1 \\ 1 & 1/2 & 0 \end{bmatrix}$

Figure 3: Graph J

$\begin{bmatrix} 0 & 1/2 & 0 \\ 0 & 0 & 1 \\ 1 & 1/2 & 0 \end{bmatrix}$

$\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$

$\begin{bmatrix} 0 & 1/2 & 0 \\ 1/2 & 0 & 1 \\ 1 & 1/2 & 0 \end{bmatrix}$

$\begin{bmatrix} 0 & 1/2 & 0 \\ 1/2 & 0 & 1 \\ 1/2 & 1/2 & 0 \end{bmatrix}$



SUB
FOR

Given a matrix M , $M = \begin{bmatrix} 4 & 5 \\ 3 & 2 \end{bmatrix}$ and a vector $V = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$. Apply M on V and normalise it to obtain the resultant vector, $R = \begin{bmatrix} a \\ b \end{bmatrix}$

Note: Precision level of at least four decimal places to be considered for computation

5) Enter the value of a _____.

1 point

6) Enter the value of b _____.

$$\begin{bmatrix} 0 & 1/2 & 0 \\ 1/2 & 0 & 1 \\ 1 & 1/2 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 1/2 & 0 \\ 1/2 & 0 & 1 \\ 1/2 & 1/2 & 0 \end{bmatrix}$$

Given a matrix M , $M = \begin{bmatrix} 4 & 5 \\ 3 & 2 \end{bmatrix}$ and a vector $V = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$. Apply M on V and normalise it to obtain the resultant vector, $R = \begin{bmatrix} a \\ b \end{bmatrix}$

Note: Precision level of at least four decimal places to be considered for computation

5) Enter the value of a _____

6) Enter the value of b _____

**SUB
FOR**

7) Which of the following are TRUE for the Hubs and Authorities algorithm?

Statement I - The Authority update rule states that for each page p , update $\text{auth}(p)$ is the sum of the hub scores of all pages that point to it.

Statement II - The Hub update rule states that for each page p , update $\text{hub}(p)$ is the sum of the authority scores of all pages that it points to.

- I only
- II only
- Both
- None

Assume the shown pageranks for the given nodes at some point of time

2

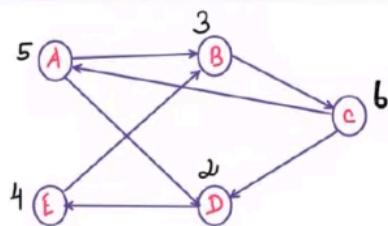


Figure 6: Question 7

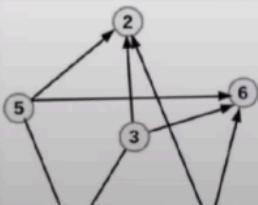
8) Find the page rank score of web pages B in the next iteration:

**SUB
FOR**

1 point

9) Find the page rank score of web pages D in the next iteration:

10) What is the score value of authority(a) and hub(h) respectively for node 5 in the following figure after applying 1-step hub-authority computation (i.e. when k is 1)? Assume initial hub and authority of each node as 1. 1 point



(e) Which of the following mean and authority of each node as 1.

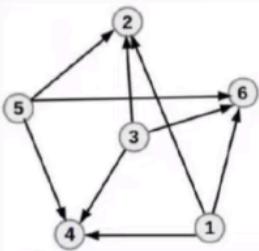


Figure 8: Question 8

- a(1)=3, h(1)=3
- a(1)=3, h(1)=0
- a(1)=0, h(1)=3
- a(1)=0, h(1)=0

11) Two vectors V1 and V2 are added in the XY plane. Given that V1 is of a very high magnitude when compared to V2, then the resultant vector is **1 point**

- same as V1
- independent of V2
- closer to the direction of V1
- closer to the direction of V2

12) Which of the following is TRUE for a Markov Matrix?

1 point

Statement I - The sum of elements in every column is same.
Statement II - Highest eigenvalue of a Markov matrix is 1.

- I only
- II only

12) Which of the following is TRUE for a Markov Matrix?

1 point

Statement I - The sum of elements in every column is same.
Statement II - Highest eigenvalue of a Markov matrix is 1.

- I only
- II only
- Both
- None

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Submit

Week 9 : Assignment 1

Assignment not submitted

Due date: 2023-03-29, 23:59 IST.

1) Given set E = 1, 2, 3, ..., 14,15. We pick a value a1 uniformly at random from this set E. Next, we pick another value a2, again uniformly at random from this set E. Similarly we pick 13 more values, a3, a4, ..., a15 (a total of 15 numbers are picked). Look at the sum S = a1 + a2 + ... + a15. Which of the following sets define the range from which the sum S can have values from?

- [15, 16, ..., 225]
- [15, 16, ..., 150]
- [15, 16, ..., 250]
- [1, 16, ..., 225]

2) Which of the following describes the distribution of marks among the students in a class room?

- Plot the percentage of students along the X axis and marks on the Y axis
- Plot the student id along the Xaxis and the marks on the Y axis
- Plot the marks along the X axis and the percentage of students on the Y axis
- Plot the marks along the X axis and the student id on the Y axis

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3) Which of the following are real world examples of power law distribution?

- IQ of students
- Birth weight
- SAT scores
- WWW graph

4) Identify all the invalid statements for Power law distribution.



The characteristic equation for power law is $1/e^k$

power law degree distribution come by in real world networks because of preferential attachment

power law degree distribution come by in real world networks because of random attachment



The characteristic equation for power law is $1/k^a$ where a is a constant

5) Consider we have a network of nodes. How does the new incoming node select a node for preferential attachment?

- Node with maximum number of friends
- Node with minimum number of friends

5) Consider we have a network of nodes. How does the new incoming node select a node for preferential attachment?

- Node with maximum number of friends
- Node with minimum number of friends
- Node with high clustering coefficient
- Node with high embeddedness

6) Given a network being generated by 'rich get richer' phenomenon. Figure 1 shows the snapshot of the network at time t. A new node 'u' enters the **1 point** network at time $t + 1$ and makes an edge with one of the existing nodes. What is the node that has high probability to form an edge with the new node 'u'?

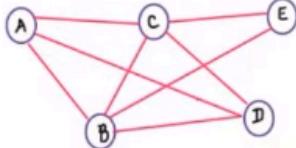


Figure 1: Network at Time T

- A
- B
- C
- D
- E

7) Given the network 'C' of five participants in a competition, a new student 'F' joins the team. What is the probability that the new student make **1 point**

- 7) Given the network 'C' of five participants in a competition, a new student 'F' joins the team. What is the probability that the new student make friends with A or C or D? **1 point**

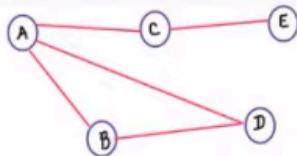


Figure 2: Network C

- 3/10
- 2/10
- 2/10
- 7/10

- 8) From the previous example in Figure 2 Network C, F became friends with A. What is the probability that a new incoming student H, makes friends **1 point** with F?

- 1/12
- 2/11
- 1/11
- 2/12

- 8) From the previous example in Figure 2 Network C, F became friends with A. What is the probability that a new incoming student H, makes friends **1 point** with F?

- 1/12
- 2/11
- 1/11
- 2/12

- 9) For the same Figure 2 Network C, after the addition of node F, assume that a new node G has entered and made friends with A, C and D. What is **1 point** the probability that any new node I makes friendship with G?

- 3/14
- 3/10
- 3/18
- 3/17

- 10) In a random graph with 500 nodes and edges between any two nodes with a probability of 0.3, where can one expect the peak of the degree- **1 point** distribution graph?

- 500
- 250
- 100
- 150

You may submit any number of times before the due date. The final submission will be considered for grading.

[Submit Assignment](#)

Week 10 : Assignment 1

Assignment not submitted

Due date: 2023-04-05, 23:59 IST.

- 1) Choose the correct option based on the given statements. Statement I - A disease's spread depends on whether the network is sparsely connected or densely. Statement II - A disease's spread depends on its degree of contagiousness. **1 point**

- I only is True
- II only is True
- Both are True
- None is True

- 2) Consider the following network D where node A is infected with a disease and the probability of spreading a disease from node A to its co

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- 2) Consider the following network D where node A is infected with a disease and the probability of spreading a disease from node A to its connected nodes is 0.6. If the disease starts spreading from node A, then the expected number of nodes with the disease is **1 point**

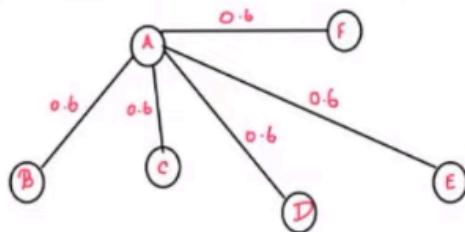


Figure 1: Network D

- 2
- 3
- 4
- 5

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1 point

- 3) Given the reproductive number of an epidemic is $R_0 < 1$, Comment about the disease spread in the network.

- The disease dies out with a positive probability
- The disease persists with a positive probability
- The disease persists forever in the network
- The disease dies out with probability 1

- 4) Consider a disease 'X'. People who are diagnosed in the earlier stage have high chance of recovery. But the intense infection of 'X' will lead to death. The recovered people do not have a chance to get infected again. What kind of model does this disease 'X' exhibit? **1 point**

- SIS
- SIR
- Both
- None

- 5) Suppose the basic reproductive number is estimated to be $R_0 = 1.5$. If a vaccine giving 100% immunity is available next time and a fraction $v = 0.3$ of randomly selected individuals were vaccinated, an estimate of the new reproductive number would be **1 point**

- 1.05
- 1.1
- 1.2
- 1.3

- 6) Given that the Reproductive number of an epidemic in action is 1.1. What are valid attempts to curb the disease or reduce the reproductive **1 point**

Q 1.5

6) Given that the Reproductive number of an epidemic in action is 1.1. What are valid attempts to curb the disease or reduce the reproductive number? 1 point

- Isolate the infected person so that we reduce the number of people getting infected.
- Create awareness among the population to follow proper hygiene thereby reducing the probability of the disease spread
- Avoid visiting public gatherings to reduce contact probability with infected persons
- All the above

7) In the percolation model, it is possible to find if a node will be infected or not without any notion of time. When can you say that a node 'A' is susceptible for infection in a percolation model? 1 point

- If there exists at least one path with all open edges from the infected node to the node 'A'
- If there exists at least one path with one open edge from the infected node to the node 'A'
- If there exists more than one path with one open edge from the infected node to the node 'A'
- If there exists at least one path with all closed edges from the infected node to the node 'A'

If there exists at least one path with all closed edges from the infected node to the node 'A'

8) Which of the following model can run for infinite number of steps in a network? 1 point

- SIR
- SIS
- Both
- None

9) Given the probability of spreading disease is 0.4, what is the probability that the same person does not get infected for the second time? 1 point

- 0.4
- 0.6
- 0.8
- 1

10) Suppose that a person 'P1' gets infected with a contagious disease and transmits it to each person he meets independently with a probability of 0.64. Further, suppose that he comes in contact with 450 people from the population while he is contagious. What is the expected number of secondary infections produced? 1 point

- 450
- 288
- 29
- 64



You may submit any number of times before the due date. The final submission will be considered for grading.

[Submit Answers](#)

Week 11 : Assignment 1

Assignment not submitted

Due date: 2023-04-12, 23:59 IST.

- 1) Assume you have 50 friends and each of your friend has 50 other friends. You would like to invite all of them to a party. What is the maximum **1 point** number of people you expect to the party?

- 2500
- 100
- 2550
- 250



- 2) Which of the following is True for the Milgram's small world experiment? **1 point**

- Each letter took exactly 6 hops to reach the destination
- Each letter took an average of 6 hops to reach the destination
- Each letter took a maximum of 6 hops to reach the destination
- Each letter took minimum 6 hops to reach the destination

Each letter took minimum 6 nops to reach the destination

- 3) Assume that you have a business run through a network of entrepreneurs. Each of your customer has 100 more customers. Similarly, each of their customers has 100 customers and so on. Then, how many people can you reach in i levels (Level one refers to your customers, level 2 refers to your customers' customers and so on)? **1 point**

-
- 100×100
-
- $100 \times i$
- 100^i
- i^{100}

- 4) What are the two characteristics that cause small word phenomena according to Watts Strogatz model? **1 point**

- Homophily
- Social influence
- Focal closure
- Weak ties

Weak ties

- 5) Assume you have your own friendship network with numerous friends and call this part of the network as cluster 'A'. There is a cluster 'B' with lot **1 point** of individuals who are friends. You have met an individual in cluster 'B' make friends with that individual. This friendship represents

- social influence
- triadic closure
- homophily
- weak tie

- 6) Given that the number of nodes in a circular network is 1,000,000 and all the adjacent nodes remain connected, we rewire the edges with a **1 point** probability of 0.4. What will be the average path length of the network?

- 12
- 10
- 8
- 6

- 7) Small world networks have **1 point**

7) Small world networks have

1 point

- small average shortest path (global) and small clustering coefficient (local)
- Large average shortest path (global) and high clustering coefficient (local)
- High average shortest path (global) and low clustering coefficient (local)
- small average shortest path (global) and high clustering coefficient (local)



8) Which of the following statements are correct for Watts Strogatz model?

1 point

-
- 'n' nodes arranged in 2-D lattice where the connections between the nodes are all random.
-
- 'n' nodes arranged in a 2-D lattice where every node is connected to the nodes on its left, right, top, bottom and diagonally opposite
-
- 'n' nodes arranged in a 2-D lattice where every node is connected to every other node.
-
- 'n' nodes arranged in a 2-D lattice where every node is connected to the nodes on its left, right, top, bottom and diagonally opposite, and, some edges are randomly laid in the network between any two nodes.

9) What is random rewiring in a generative model?

1 point

- Remove all edges in a network and randomly add same number of edges
- Deletion of one random edge and addition of one random edge
- Remove edges in a network and randomly add edges with a probability 'p'
- addition of random edge to the network with a probability 'p'

10) In a friendship graph, the distance between nodes P and Q is 10. If we create edges according to the WattsStrogatz model given k=2, what is the 1 point probability of them being friends through a weak tie?

- 0.001
- 0.01
- 0.1
- 0.25

You may submit any number of times before the due date. The final submission will be considered for grading.

Submit Answers

Week 12 : Assignment 12

Assignment not submitted

1) Comment on the diameter of a network given that the number of rewired edges increases.

- increases
- decreases
- initially increases then decreases
- initially decreases then increases

- 2) In the given network, assume that each node has the information of strong tie of each neighbor. Pick out the path followed by Myopic search to **1 point** reach node 10 from node 6.

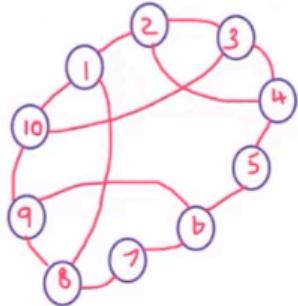


Figure 1: Graph G

- 5
- 7
- 8
- 9

- 3) Which of the following is True?

Statement I - Myopic search always perform as good as an Optimal search algorithm.
Statement II - Time complexity of myopic search is $\log n$

- I only
- II only
- Both
- None

- 4) A node that does not belong to the innermost core of the network but has equal spreading power (cascade capacity) as the innermost core is **1 point** called

- Pseudo-core
- Special-core
- Hyper-core
- Periphery

- Periphery

- 5) Pick out the characteristics that decides if an internet meme can become viral.

- structure of network
- novelty of meme
- infecting right people with meme
- all the above

- 6) The nodes which should be initially infected in a network in order to make an Internet meme go viral should have **1 point**

- High degree
- High centrality
- High betweenness
- high coreness

- 7) How many nodes are present in the 3-core of the given network H?

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1 point

7) How many nodes are present in the 3-core of the given network H?

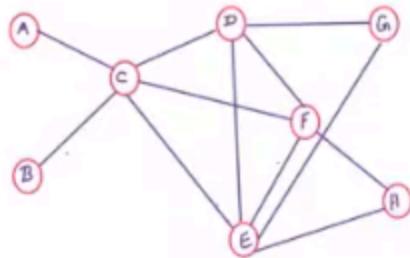


Figure 2: Network H

- 2
- 4
- 6
- 8

- 6
- 8

8) A subgraph of a graph is called as k-core if

- maximum degree of the nodes in the subgraph is k
- average degree of the nodes in the subgraph is k
- minimum degree of the nodes in the subgraph is k
- all the nodes in the subgraph have degree k

9) What happens in the i^{th} iteration of the K-shell decomposition?

- All nodes of degree i are removed
- All nodes of degree i and below i are removed recursively
- All nodes of degree i or greater than i are removed
- only one node with degree i is removed uniformly at random

10) Which of the following cores have the most influential people in the network?

- 1
- 2
- 3
- 4

