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## Course outline

About NPTEL

How does an NPTEL online course work?

Week 0

Practice: Week 0: Assignment 0

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# Week 0: Assignment 0

Your last recorded submission was on 2024-01-10, 22:10 IST

Note : This assignment is only for practice purpose and it will not be counted towards the Final score

- Pick out the appropriate data structure to perform depth first search in a graph. 1 point
  - ☐ list
  - ☐ stack
  - ☐ queue
  - ☐ set
- What is the number of edges in a complete graph with  $n$  vertices? 1 point
  - ☐  $n(n+1)/2$
  - ☐  $n(n-1)/2$
  - ☐  $n * n/2$
  - ☐  $n(n^2)/2$
- Any kind of digital artefact traversing through the Internet, be it an image, audio, video or a file in some other format. 1 point
  - ☐ Computer virus
  - ☐ any shopping website
  - ☐ Facebook
  - ☐ Internet meme
- Pick out all the social networking sites. 1 point
  - ☐ Facebook
  - ☐ Twitter
  - ☐ Instagram
  - ☐ Bing
- Any simple graph has 1 point
  - ☐ loops
  - ☐ parallel edges
  - ☐ both
  - ☐ none
- A connected undirected graph containing  $n$  vertices and  $n-1$  edges 1 point
  - ☐ cannot have cycles
  - ☐ can contain atmost one cycle
  - ☐ must contain atleast one cycle
  - ☐ must contain atleast two cycles
- Which type of graph has all the vertices of the first set connected to all the vertices of the second set? 1 point
  - ☐ Complete
  - ☐ directed
  - ☐ bipartite
  - ☐ complete bipartite
- Consider an undirected graph  $G$  with  $n$  vertices and  $e$  edges, what is the sum of the degrees of each vertex? 1 point
  - ☐  $2e$
  - ☐  $2ne$
  - ☐  $2n$
  - ☐  $ne$
- What is the maximum number of possible non-zero values in an adjacency matrix of a simple graph with  $n$  vertices? 1 point
  - ☐  $n * (n-1)$
  - ☐  $n * (n-1)/2$
  - ☐  $n * (n+1)$
  - ☐  $n * (n+1)/2$
- In a Bipartite graph, the minimum number of colours required to colour all nodes if no two adjacent nodes can have the same colour is 1 point
  - ☐ 1
  - ☐ 2
  - ☐ 3
  - ☐ 4

Check Answers and Submit

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online course work?

## Week 0

## Week 1

Lecture 01 - Introduction (9  
min)

Lecture 02 - Answer to the  
puzzle (6 min)

Lecture 03 - Introduction to  
Python-1 (21 min)

Lecture 04 - Introduction to  
Python-2 (28 min)

Lecture 05 - Introduction to  
Networks-1 (10 min)

Lecture 06 - Introduction to  
Networks-2 (45 min)

Lecture 07 - Social Networks:  
The Challenge (4 min)

Lecture 08 - Google Page  
Rank (2 min)

Lecture 09 - Searching in a  
Network (2 min)

Lecture 10 - Link Prediction (2  
min)

Lecture 11 - The Contagions  
(2 min)

Lecture 12 - Importance of  
Acquaintance (1 min)

Lecture 13 - Marketing on  
Social Networks (2 min)

Week 1 Feedback Form  
Social Networks

Quiz: Week 1 : Assignment  
1

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## Week 1 : Assignment 1

The due date for submitting this assignment has passed.

Due on 2024-02-07, 23:59 IST.

## Assignment submitted on 2024-02-07, 10:52 IST

1) Which of the following is the output of the given code segment?

1 point

```
l=[]
l.append (5)
l.append ("AAA")
l.append ([5,5])
print(l)
```

- ☐ l=[5, 'AAA', [2, 3]]
- ☐ l=[5, 'AAA', [2, 3]]
- ☐ l=[5, 'AAA', 2, 3]
- ☐ error

Yes, the answer is correct.

Score: 1

Accepted Answers:

[5, 'AAA', [2, 3]]

2) Assume you have to roll a dice with six faces. Choose the statement to simulate the same.

1 point

- ☐ random.randint(1, 6)
- ☐ random.randrange(1, 6)
- ☐ random.randrange(1, 7)
- ☐ random.randrange(1,6)

Yes, the answer is correct.

Score: 1

Accepted Answers:

random.randint(1, 6)

3) Select the code to create the given dictionary:  
(1: 2, 2: -4, 3: -6, 4: -8, 5: 10, 6: 12, 7: 14, 8: 16, 9: 18)

1 point

- ☐ d={x:x\*\*2 for x in range(1,10)}
- ☐ print(d)
- ☐ d={x:x\*\*2 for x in range(1,9)}
- ☐ print(d)
- ☐ d={x:x\*\*2 for x in range(1,10)}
- ☐ print(d)
- ☐ d={x:x\*\*2 for x in range(1,9)}
- ☐ print(d)

Yes, the answer is correct.

Score: 1

Accepted Answers:

d={x:x\*\*2 for x in range(1,10)}

print(d)

4) What does the G(p,p) random graph model in Networks library represent?

1 point

- ☐ A graph with n nodes and p edges
- ☐ A graph with n nodes and p is the probability of an edge between any two nodes
- ☐ A graph with n nodes and p-1 edges
- ☐ A graph with n nodes and p is the probability of a path of any length between every two nodes

Yes, the answer is correct.

Score: 1

Accepted Answers:

A graph with n nodes and p is the probability of an edge between any two nodes

5) What is the output of the following code snippet?

1 point

```
import networkx
G = networkx.Graph()
G.add_edges_from([(2,1), (2,3), (4,2), (2,5)])
G.remove_node(1, 2)
print(len(G.edges()))
```

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3

Yes, the answer is correct.

Score: 1

Accepted Answers:

0

6) Which of the following functions is used to find the shortest path length?

1 point

- ☐ networkx.dijkstra\_path\_length(G, 'node a')
- ☐ networkx.dijkstra\_path\_length('node a', 'node b')
- ☐ networkx.dijkstra\_path\_length('node a', 'node b', G)
- ☐ networkx.dijkstra\_path\_length(G, 'node a', 'node b')

Yes, the answer is correct.

Score: 1

Accepted Answers:

networkx.dijkstra\_path\_length(G, 'node a', 'node b')

7) What does the Page Rank algorithm measure?

1 point

- ☐ The number of friends a person has in the social network
- ☐ The person who is more important in the network
- ☐ The person who is very frequently posting content on the social network
- ☐ The total number of connections in the network

Yes, the answer is correct.

Score: 1

Accepted Answers:

The person who is more important in the network

8) The code inside the 'try' block is monitored for any exceptions. The 'except' block contains the code to handle the exception, providing an alternative path for the program to continue execution. Find the output for the given code snippet.

1 point

```
a=[5,2,7,3,8]
try:
    a**[2]
    if(a%2==0):
        print("It is an even number")
    else:
        print("It is an odd number")
except:
    print("Element does not exist")
```

- ☐ Element does not exist
- ☐ It is an even number
- ☐ It is an odd number
- ☐ error

Yes, the answer is correct.

Score: 1

Accepted Answers:

It is an odd number

9) What is the maximum number of graphs possible from 70 nodes?

1 point

- ☐  $2^{70}$
- ☐  $\left(\frac{70}{2}\right)$
- ☐  $2^{\left(\frac{70}{2}\right)}$
- ☐  $\left(\frac{70}{2}\right)$
- ☐  $70^2$

Yes, the answer is correct.

Score: 1

Accepted Answers:

$2^{\left(\frac{70}{2}\right)}$

10) Which algorithm or concept should be used to suggest connections on LinkedIn?

1 point

- ☐ Link Prediction
- ☐ Page Ranking
- ☐ HITS algorithm
- ☐ BFS

Yes, the answer is correct.

Score: 1

Accepted Answers:

Link Prediction

NPTEL • Social Networks

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Q&amp;A

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Review Assignment

Course Recommendations

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- Lecture 16 - Synonymy Network
- Lecture 17 - Web Graph
- Lecture 18 - Social Network Datasets
- Lecture 19 - Datasets: Different Formats
- Lecture 20 - Datasets: How to Download?
- Lecture 21 - Datasets: Analysing Using Networks
- Lecture 22 - Datasets: Analysing Using Graphs
- Lecture 23 - Introduction : Emergence of Connectedness
- Lecture 24 - Advanced Material : Emergence of Connectedness
- Lecture 25 - Programming Illustration : Emergence of Connectedness
- Lecture 26 - Summary to Datasets
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Week 2 : Assignment 2

The due date for submitting this assignment has passed.

Due on 2024-02-07, 23:59 IST.

Assignment submitted on 2024-02-07, 10:54 IST

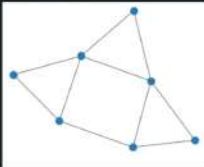
1) Which of the following statements is/are True?  
Statement I - Email network is a directed network.  
Statement II - Co-authorship network is an undirected network.

Yes, the answer is correct.  
Score: 1  
Accepted Answers: Both

2) What is the clustering coefficient of a node that has 4 neighbors and 3 connections between those neighbors?

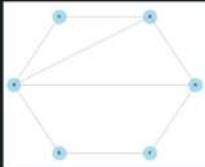
Yes, the answer is correct.  
Score: 1  
Accepted Answers: 0.5

3) Calculate the density of the given graph.



Yes, the answer is correct.  
Score: 1  
Accepted Answers: 10/21

4) Find the clustering coefficient of node B in the given graph.

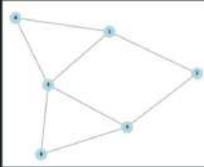


Yes, the answer is correct.  
Score: 1  
Accepted Answers: 0.6667  
(Typic. Range) 0.66,0.68

5) Which statement accurately reflects the characteristics of node degrees according to Power law?

Yes, the answer is correct.  
Score: 1  
Accepted Answers: a small number of individuals have a substantially higher number of connections compared to the majority

6) What is the diameter of the following graph?



Yes, the answer is correct.  
Score: 1  
Accepted Answers: 2

7) Which of the following formats was created as a part of Gephi project?

Yes, the answer is correct.  
Score: 1  
Accepted Answers: G2OP

8) Given is a graph G with  $|V| := n$  number of nodes and  $|E|$  number of edges. In which of the following cases, we can guarantee that G is connected?

Yes, the answer is incorrect.  
Score: 0  
Accepted Answers:  $|E| := n(n-1)/2$

9) Which of the following statements is True for GML format of networks?

Yes, the answer is correct.  
Score: 1  
Accepted Answers: Both

10) In the mentioned synonymy network, why might there be a path between words like "love" and "hated"?

Yes, the answer is correct.  
Score: 1  
Accepted Answers: Words can undergo semantic shifts, acquiring new meanings or evolving to represent opposite concepts

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## About NPTEL

How does an NPTEL online course work?

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Lecture 27 - Introduction

Lecture 28 - Graphs and the Strength of weak ties

Lecture 29 - Trade, clustering coefficient and neighbourhood overlap

Lecture 30 - Structure of weak ties, bridges, and local bridges

Lecture 31 - Validation of Gitterman's experiment using real phone data

Lecture 32 - Streetclosures

Lecture 33 - Structural Holes

Lecture 34 - Social Capital

Lecture 35 - Tie Strength, Social Media and Peer-to-Peer Engineering

Lecture 36 - Betweenness, Modularity and Graph Partitioning

Lecture 37 - Finding Communities in a graph (Brute Force Method) - I

Lecture 38 - Community Detector Using Given Neighbour Algorithm

Lecture 39 - Visualizing Communities using Gephi

Lecture 40 - Strong and Weak Relationship - Summary

Week 3 Feedback Form: Social Networks

Quiz: Week 3 Assignment 3

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## Week 3 : Assignment 3

The due date for submitting this assignment has passed.

Due on 2024-02-14, 23:59 IST.

Assignment submitted on 2024-02-14, 20:28 IST

1) Consider the following definitions of local bridge

1 point

- i) An edge with zero neighbourhood overlap.
- ii) An edge whose endpoints have no friends in common.
- iii) An edge whose deletion results in increasing the distance between the endpoints to a value strictly more than two.
- iv) An edge that does not form the side of any triangle in the graph.

Which of the above definitions are correct?

- ☐ i, ii and iv
- ☐ ii, iii and iv
- ☐ i, ii and iii
- ☐ All of the above

Yes, the answer is correct.

Score: 1

Accepted Answers:

All of the above

2) Assume A is a friend of B and B is a friend of C, eventually A becomes a friend of C. This phenomena is called the

1 point

- ☐ triadic closure
- ☐ weak tie
- ☐ strong tie
- ☐ structural hole

Yes, the answer is correct.

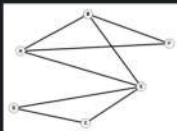
Score: 1

Accepted Answers:

triadic closure

3) Given  $E_{ij}$  is the Embeddedness of an edge between nodes  $i$  and  $j$ , choose the correct option for the given network.

0 points



$$E_{AB} < W_{CD}$$

$$E_{AB} > W_{CD}$$

$$E_{AB} = W_{CD}$$

$$E_{AB} \leq W_{CD}$$

$$E_{AB} \geq W_{CD}$$

Yes, the answer is correct.

Score: 0

Accepted Answers:

$E_{AB} > W_{CD}$

4) While implementing the Girvan Newman algorithm on a certain graph G, you observe that edge  $E_2$  gets removed after  $E_1$ . What can you comment about them?

1 point

- ☐  $E_1$  has higher betweenness than  $E_2$
- ☐  $E_2$  has higher betweenness than  $E_1$
- ☐  $E_1$  has more shortest paths passing through it
- ☐  $E_2$  has higher betweenness than  $E_1$ , also  $E_2$  has more shortest paths passing through it

Yes, the answer is correct.

Score: 0

Accepted Answers:

$E_1$  has higher betweenness than  $E_2$ , also  $E_1$  has more shortest paths passing through it

5) Which of the two statements are True?

1 point

Statement I - The nodes at the ends of a local bridge in a graph have no common nodes.

Statement II - Removing bridges from a graph leads to a disconnected graph.

- ☐ I only
- ☐ II only
- ☐ Both
- ☐ None

Yes, the answer is correct.

Score: 1

Accepted Answers:

Both

6) Find the Neighbourhood overlap of the edge connecting V0 and V3 in the given graph.

1 point



$$0/4$$

$$0/5$$

$$1/5$$

$$1/4$$

Yes, the answer is correct.

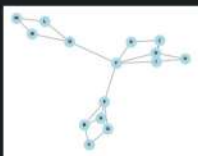
Score: 1

Accepted Answers:

1/4

7) For the given network, identify the node that has multiple local bridges and spans the structural hole in the organisation.

1 point



- ☐ E
- ☐ F
- ☐ D
- ☐ H

Yes, the answer is correct.

Score: 1

Accepted Answers:

F

8) In a small social network resembling Facebook, individuals are linked by edges representing friendship connections. The edges in this network are weighted to signify the strength of these connections. Which statement accurately reflects the nature of this network?

1 point

- ☐ Strong ties generally exhibit low edge weights.
- ☐ Strong ties typically possess high edge betweenness.
- ☐ Strong ties are primarily observed as inter-community edges, connecting two distinct communities.
- ☐ None of the above statements are accurate.

Yes, the answer is correct.

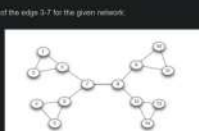
Score: 1

Accepted Answers:

None of the above statements are accurate.

9) Find the betweenness of the edge 3-7 for the given network.

0 points



$$20$$

$$22$$

$$30$$

$$33$$

Yes, the answer is correct.

Score: 0

Accepted Answers:

20

10) For the same network in Question 9, find the edge with maximum betweenness.

1 point

$$1-2$$

$$6-7$$

$$7-8$$

$$13-14$$

Yes, the answer is correct.

Score: 1

Accepted Answers:

7-8

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## Lecture 41 - Introduction to Homophily - Should you watch your company?

## Lecture 42 - Selection and Social Influence

## Lecture 43 - Interplay between Selection and Social Influence

## Lecture 44 - Homophily - Definition and measurement

## Lecture 45 - Focal Closure and Membership Closure

## Lecture 46 - Introduction to Fatman Evolutionary model

## Lecture 47 - Fatman Evolutionary Model- The Base Code (Adding people)

## Lecture 48 - Fatman Evolutionary Model- The Base Code (Adding Social Foci)

## Lecture 49 - Fatman Evolutionary Model- Implementing Homophily

## Lecture 50 - Quantifying the Effect of Triadic Closure

## Lecture 51 - Fatman Evolutionary Model- Implementing Closeness

## Lecture 52 - Fatman Evolutionary Model- Implementing Social Influence

## Lecture 53 - Fatman Evolutionary Model- Stating and analyzing longitudinal data

## Week 4 Feedback Form Social Networks

## Quiz: Week 4 : Assignment 4

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## Week 4 : Assignment 4

The due date for submitting this assignment has passed.

Due on 2024-02-21, 22:59 IST.

## Assignment submitted on 2024-02-21, 22:43 IST

1) "People tend to have links to others who are similar to them". Identify this process that impacts the structure of Social Network.

1 point

- ☐ Social Influence  
☐ Triadic Closure  
☒ Selection  
☐ Betweenness

Yes, the answer is correct.

Score: 1

Accepted Answers:  
Selection

2) Given two authors are editing Wikipedia articles. Number of articles edited by both author A and author B is 10. The total number of articles edited by either of them is 18. Compute the similarity measure.

- ☐ 18/10  
☐ 10/18  
☒ 10/26  
☐ 18/26

Yes, the answer is correct.

Score: 1

Accepted Answers:  
10/18

3) Dynamics of friendships formation and behaviour of people in a network is affected by

1 point

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

Yes, the answer is correct.

Score: 1

Accepted Answers:  
Both Selection and Social Influence

4) Suppose Hari and Joy have k common friends. Given that each common friend gives Hari and Joy an independent probability p of forming a link, what is the probability that there will exist a link between Hari and Joy?

- ☐  $p^k$   
☐  $1 - p^k$   
☒  $1 - (1 - p)^k$   
☐  $pk$

Yes, the answer is correct.

Score: 1

Accepted Answers:  
 $1 - (1 - p)^k$

5) Ram and Raghu met joined a Yoga class. Their similarity measure was 0.005 at the time of joining. They became good friends on Day 3. What is 0 points the similarity measure right before they became friends?

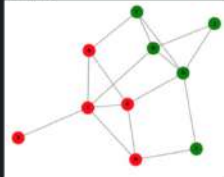
- ☐ 0.04  
☐ 0.004  
☒ 1.005  
☐ 0.005

Yes, the answer is correct.

Score: 0

Accepted Answers:  
0.004

6) Given the friendship network in a dance school, 5 girls represented by red nodes and 5 boys represented by green nodes, Find the Homophily of the network.



- ☐ 0  
☐ 1/4  
☒ 1/2  
☐ 1

Yes, the answer is correct.

Score: 1

Accepted Answers:  
1/2

7) Which of the following conditions is ideal for a good community?

1 point

- ☒ ratio of intra-community edges to inter-community edge should be high  
☐ ratio of intra-community edges to inter-community edge should be low  
☐ ratio of intra-community edges to inter-community edge should be 1  
☐ ratio of intra-community edges to inter-community edge should be 0

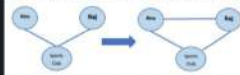
Yes, the answer is correct.

Score: 1

Accepted Answers:  
ratio of intra-community edges to inter-community edge should be high

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

1 point



- ☐ Triadic Closure  
☐ Structural hole  
☒ Focal closure  
☐ Membership closure

Yes, the answer is correct.

Score: 1

Accepted Answers:  
Focal closure

9) When calculating the homophily value, what range of values is expected when the network exhibits heterogeneity?

0 points

- ☐ 0  
☐ 1  
☒ less than 1  
☐ greater than 1

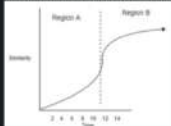
Yes, the answer is correct.

Score: 0

Accepted Answers:  
less than 1

10) Which phenomenon is represented in region B of the given graph?

1 point



- ☐ Selection  
☒ Social Influence  
☐ Focal Closure  
☐ Membership

Yes, the answer is correct.

Score: 1

Accepted Answers:  
Social Influence

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- Lecture 55: Spatial Segregation: Simulation of the Schelling Model
- Lecture 56: Spatial Segregation: Conclusion
- Lecture 57: Schelling Model Implementation-1 (Introduction)
- Lecture 58: Schelling Model Implementation-2 (Base Code)
- Lecture 59: Schelling Model Implementation- Visualization and Getting a list of unutilized nodes
- Lecture 60: Schelling Model Implementation - Getting a list of unutilized nodes
- Lecture 61: Schelling Model Implementation - Shifting the unutilized nodes and visualizing the final graph
- Lecture 62: Positive and Negative Relationships - Introduction
- Lecture 63: Structural Balance
- Lecture 64: Enemy's Enemy is a Friend
- Lecture 65: Characterizing the structure of balanced networks
- Lecture 66: Balance Theorem
- Lecture 67: Proof of Balance Theorem
- Lecture 68: Introduction to positive and negative edges
- Lecture 69: Outline of implementation
- Lecture 70: Creating graph, displaying it and counting unstable trianges
- Lecture 71: Mixing a network from an unstable to stable state
- Lecture 72: Forming two coalitions
- Lecture 73: Forming two coalitions (Continued)
- Lecture 74: Visualizing coalitions and the evolution
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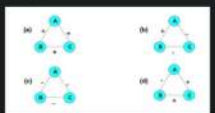
## Week 5 : Assignment 5

The due date for submitting this assignment has passed.

Due on 2024-02-28, 23:59 IST.

Assignment submitted on 2024-02-28, 23:20 IST

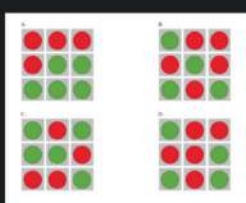
1) Select all the triangles that are stable. 1 point



- ☐ (a)
- ☐ (b)
- ☐ (c)
- ☐ (d)

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
(a)  
(d)

2) Which of the following figure represents a unutilized central node according to the Schelling's model of spatial segregation, given the threshold. 1 point



- ☐ (a)
- ☐ (b)
- ☐ (c)
- ☐ (d)

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
(b)

3) In a 2-D grid with dimensions 120 by 90, what is the maximum number of nodes that can have exactly 8 neighbors? 1 point

- ☐ 120 x 90
- ☐ 119 x 90
- ☐ 119 x 89
- ☐ 121 x 91

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
119 x 89

4) Identify the statement that is INCORRECT. 1 point

- ☐ Structural balance involves studying the interplay of positive and negative relationships among the nodes over time
- ☐ Structural balance is a theory that offers ways of equating the number of positive and negative edges in a network so that it becomes 'balanced'
- ☐ Structural balance illustrates a close connection between local and global network properties
- ☐ Structural balance is to understand the tension between the two forces, i.e. friendship and antagonism

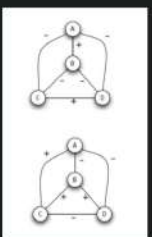
Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
Structural balance is a theory that offers ways of equating the number of positive and negative edges in a network so that it becomes 'balanced'

5) Given a triangular network with two negative relationships. When is the network stable? 0 points

- ☐ Never
- ☐ Sometimes
- ☐ Always
- ☐ Cannot be inferred

Yes, the answer is correct.  
Score: 0  
Accepted Answers:  
Sometimes

6) Which of the following complete graphs are structurally balanced? 1 point



- ☐ A only
- ☐ B only
- ☐ Both A and B
- ☐ None

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
A only

7) Given a relationship between 3 people ( $r, s, t$ ) where + represents friendship and - represents enmity, which of the following options below asks 1 point options to become stable?

- ☐ one friendship transforms to enmity
- ☐ one enmity becomes friendship
- ☐ both friendships turn to enmity
- ☐ cannot become stable

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
one friendship transforms to enmity  
one enmity becomes friendship

8) Consider Frank McCown's simulation of the Schelling model illustrated in the course. The simulation has parameters: Similar (threshold), empty (fraction of empty cells) and red/blue ratio. Choose the INCORRECT statements from the options. 1 point

- ☐ As similar increases, it takes more time for the system to stabilise
- ☐ The system will always stabilise no matter what the parameters are
- ☐ The system can stabilise even if similar = 100%
- ☐ Spatial segregation doesn't always induce communities/clustering in the grid

No, the answer is incorrect.  
Score: 0  
Accepted Answers:  
The system will always stabilise no matter what the parameters are

9) Which of the following statements are True for structural balance? 1 point

Statement I - For every set of three nodes exactly one of them is labeled +

Statement II - For every set of three nodes if all three of these edges are labeled +

- ☐ I only
- ☐ II only
- ☐ Both
- ☐ None

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
Both

10) Assume there are 100 people in a community who know each other. Pick out all the scenarios when the community network is stable. 1 point

- ☐ 75 people are friends with each other, 25 are friends with each other and there is a negative relationship between these two groups
- ☐ At 100 people are friends with each other
- ☐ 30 people are friends among each other, 40 are friends with each other, 30 are friends with each other and there is antagonism between each group
- ☐ There is antagonism amidst set A of 75 people and antagonism amidst set B of 25 people and friendship between set A and set B

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
75 people are friends with each other, 25 are friends with each other and there is a negative relationship between these two groups  
At 100 people are friends with each other



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## Course outline

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How does an NPTEL online course work?

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## Lecture 75: The Web Graph

## Lecture 76: Collecting the Web Graph

## Lecture 77: Equal Coin Distribution

## Lecture 78: Random Walk Coin Distribution

## Lecture 79: Google Page Ranking Using Web Graph

## Lecture 80: Implementing PageRank Using Points Distribution Method-1

## Lecture 81: Implementing PageRank Using Points Distribution Method-2

## Lecture 82: Implementing PageRank Using Points Distribution Method-3

## Lecture 83: Implementing PageRank Using Points Distribution Method-4

## Lecture 84: Implementing PageRank Using Random Walk Method-1

## Lecture 85: Implementing PageRank Using Random Walk Method-2

## Lecture 86: DegreeRank versus PageRank

## Week 6 Feedback Form: Social Networks

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## Week 6 : Assignment 6

The due date for submitting this assignment has passed.

Due on 2024-03-06, 23:59 IST.

As per our records you have not submitted this assignment.

1) What happens when the gold coins distribution game converge?

1 point

- ☐ all the nodes get equal number of coins  
☐ all the nodes are visited at least once  
☐ each node might have different number of coins  
☐ one node gets all the coins

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
each node might have different number of coins

2) In a game distributing gold coins across a network, each node begins with an equal number of coins. Following one round of redistribution, the total number of coins across the network remains the same. Which network structure guarantees this outcome?

1 point

- ☐ Random network  
☐ Scale-free network  
☐ Ring network  
☐ None of the above

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
Ring network

3) Which of the following statements is True for Teleportation?  
Statement I - prevents random walk from getting stuck in certain regions of the graph  
Statement II - Jumping to any random node in the network

1 point

- ☐ I only  
☐ II only  
☐ Both  
☐ None

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
Both

4) If `rx` represents networkx library then, for a graph `G`, what does `rx.pagerank(G)` return?

1 point

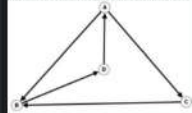
- ☐ list of nodes in the ascending order of their page rank  
☐ list of Page ranks of all nodes  
☐ dictionary of node, Page rank pairs  
☐ dictionary of edge, page rank pairs

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
dictionary of node, Page rank pairs

5) If the initial PageRank of each node is  $\frac{1}{3}$  for the given graph below, what will be the PageRank of the nodes after 2 iterations?

1 point



- ☐ A=1/4, B=1/4, C=1/4, D=1/4  
☐ A=1/4, B=3/8, C=1/8, D=1/4  
☐ A=1/4, B=1/2, C=1/8, D=1/4  
☐ A=1/4, B=1/4, C=1/8, D=3/8

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
A=1/4, B=1/4, C=1/8, D=3/8

6) Pick out the invalid statement for web graphs.

1 point

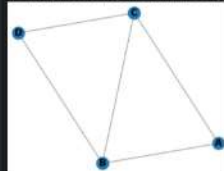
- ☐ Nodes represent web pages  
☐ edges represents a hyperlink from one page to another  
☐ It is a directed graph  
☐ It is a complete graph

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
It is a complete graph

7) Consider the following graph for the gold coins distribution game. Each node in the graph  $G=(A, B, C, D)$  has 20, 30, 45, 30 corresponding number of gold coins initially. What is the number of gold coins after one iteration?

0 points



- ☐ 25, 40, 35, 20  
☐ 40, 25, 35, 20  
☐ 25, 40, 30, 20  
☐ 40, 35, 30, 25

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
25, 40, 35, 20

8) How is the PageRank vector typically computed in the PageRank algorithm?

1 point

- ☐ Solving a system of linear equations  
☐ Using a recursive algorithm  
☐ Iteratively updating the vector until convergence  
☐ All the above

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
All the above

9) In a graph of individuals with edges representing friendship, choose the correct option based on the two statements given below.

1 point

Statement I - Take a random walk and drop 1 coin at each node while visiting. Individuals accumulating the most coins will be the most popular.  
Statement II - Give an equal number of coins to all individuals at the beginning and then each individual has to distribute them equally to all of their friends at every snap. After many snaps, the individual with the most coins will be the most popular.

- ☐ Both statements are correct.  
☐ Statement I is correct and statement II is incorrect.  
☐ Statement I is incorrect and statement II is correct.  
☐ Both statements are incorrect.

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
Both statements are correct.

10) Which of the following are True for Page rank and Degree of nodes?  
Statement I - Their correlation depends on the specific characteristics of the network.  
Statement II - They capture different aspects of node importance

1 point

- ☐ I only  
☐ II only  
☐ Both  
☐ None

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
Both

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Lecture 18 - Why do we Follow?

Lecture 19 - Diffusion in Networks

Lecture 20 - Modeling Diffusion

Lecture 21 - Modeling Diffusion (Continued)

Lecture 22 - Impact of Communities on Diffusion

Lecture 23 - Cascade and Clusters

Lecture 24 - Knowledge, Thresholds and the Collective Action

Lecture 25 - An Introduction to the Programming Screenshot (Coding 4 may view)

Lecture 26 - The Basic Code

Lecture 27 - Coding the First Big Idea - Increasing the Payoff

Lecture 28 - Coding the Second Big Idea - Key People

Lecture 29 - Coding the Third Big Idea - Impact of Communities on Cascades

Lecture 30 - Coding the Fourth Big Idea - Cascades and Clusters

Week 7 Feedback Form Social Networks

Quiz: Week 7 : Assignment 7

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## Week 7 : Assignment 7

The due date for submitting this assignment has passed.

Due on 2024-03-13, 23:59 IST.

## Assignment submitted on 2024-03-13, 22:38 IST

1) Consider the modeling of information cascade in a graph  $G$ , where everyone starts with  $B$  and there is a small set  $S$  of early adopters of  $A$ . Given following two statements:  
S1: Nodes in  $S$  keep using  $A$  no matter what payoffs tell them to do.  
S2: Nodes outside  $S$  keep using  $B$  no matter what payoffs tell them to do.  
Choose the correct option.

0 points

- ☐ Both S1 and S2 are true  
☐ S1 is true but S2 is false  
☐ S2 is true but S1 is false.  
☒ Both S1 and S2 are false.

Yes, the answer is incorrect.

Score: 0

Accepted Answers:  
S1 is true but S2 is false

2) Consider a group of 10 bachelors. Six live on the first floor of the apartment and 4 live on the second floor. Suppose that each person in this group has two friends on their own floor, and one friend on the other floor. Now, a new restaurant opens, and five persons all living on the first floor each begin eating there on the first day. The action will eventually be adopted by

1 point

- ☐ Nobody in the apartment  
☐ Only the bachelors in the first floor  
☐ Only the bachelors in the second floor  
☐ Cannot say

Yes, the answer is incorrect.

Score: 0

Accepted Answers:  
Cannot say

3) If the payoff for working on your Assignment is 0.3 and participating in a Hackathon is 0.5. Five of your friends are participating in the Hackathon and six of your friends are working on the Assignment, what will you opt for?

1 point

- ☐ Participate in Hackathon  
☐ Work on Assignment  
☐ Cannot say

Yes, the answer is correct.

Score: 1

Accepted Answers:  
Participate in Hackathon

4) In the context of a cascade of adoptions of a behavior/product  $X$  within a network, which statement is NOT POSSIBLE? Consider a chain reaction of switches from  $Y$  to  $X$ .

0 points

- ☐ Eventually all nodes adopt  $X$  over time.  
☐ The cascade initiates but not before all nodes transition to  $X$ .  
☐ At a point, every node reverts to  $Y$ .  
☐ Only the initial seed node transitions to  $X$ .

Yes, the answer is incorrect.

Score: 0

Accepted Answers:  
At a point, every node reverts to  $Y$ .

5) What is the density of a cluster?

1 point

- ☐ fraction of nodes' friends present inside the cluster  
☐ fraction of the node's friends present outside the cluster  
☐ average number of friends inside the cluster  
☐ maximum number of friends inside the cluster

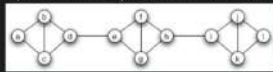
Yes, the answer is correct.

Score: 1

Accepted Answers:  
fraction of nodes' friends present inside the cluster

6) What is the cluster density of the each of the four node clusters?

1 point



☐ 1/2

☐ 2/3

☐ 1

☐ 4/3

Yes, the answer is correct.

Score: 1

Accepted Answers:  
2/3

7) Consider a network where all of its nodes have adopted an idea  $A$  with a threshold  $q$  for nodes in the remaining network to adopt  $A$ . Which of the following efforts can be a valid attempt to create a complete cascade of a new idea  $B$  in such a network? Select all that is applicable.

1 point

- ☐ increase the product price  
☐ increase the product payoff  
☐ No cluster with density less than  $(1 - q)$   
☐ Find out the key people in the network to reject idea

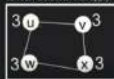
Yes, the answer is correct.

Score: 1

Accepted Answers:  
increase the product payoff  
Find out the key people in the network to reject idea

8) Assume a model for collective behavior where the threshold for each node is represented near the node. Which of the following statements are correct? Select all that apply.

1 point



- ☐ node  $U$  knows the threshold of  $V$  and  $W$ .  
☐ node  $V$  does not know the threshold of  $W$   
☐ Each of them easily decide to protest  
☐ Each node has an incomplete knowledge of the entire network

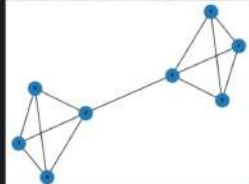
Yes, the answer is correct.

Score: 1

Accepted Answers:  
node  $U$  knows the threshold of  $V$  and  $W$ .  
node  $V$  does not know the threshold of  $W$   
Each node has an incomplete knowledge of the entire network

9) Given a network as shown in the following Figure, assume that initially every node in this network has adopted behavior  $B$ . Next, a new behavior  $A$  is introduced in the network and the nodes 7 and 8 are the initial adopters of the behavior  $A$ , i.e., nodes 7 and 8 now have adopted behavior  $A$  and the rest of the nodes have adopted behavior  $B$ . The payoff associated with  $A$  is  $a = 1/3$  and the payoff associated with  $B$  is  $b = 2/3$ . After the introduction of this new behavior  $A$  in the network, all the nodes will start weighing their options and might change their behavior. This leads to a cascade in the network. When the cascade ends, which all are the nodes who have adopted the behavior  $A$ .

1 point



☐ 7,8,9

☐ 7,8,6,5

☐ 7,8,6,3,4

☐ 7,8,6,5,4,2,3,1

Yes, the answer is correct.

Score: 1

Accepted Answers:  
7,8,6,5

10) Let  $V$  be a node in a graph. Suppose that a  $(1 - q)$  fraction of the neighbors of  $V$  have behavior  $A$ , and a  $(1 - q)$  fraction have behavior  $B$ ; that is, if  $V$ 's neighbors have  $(1 - q)$  neighbors, then  $(1 - q)$  adopt  $A$  and  $(1 - q)$  adopt  $B$ . Behavior  $A$  has a payoff of  $a$  and behavior  $B$  has a payoff of  $b$ . Then  $B$  is a better choice for  $V$  if

- ☐  $p \geq a/b$   
☐  $p \geq b/a$   
☐  $p \geq a/(a + b)$   
☐  $p \geq b/(a + b)$

Yes, the answer is correct.

Score: 0

Accepted Answers:  
 $p \geq a/(a + b)$



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- Lecture 103: Principles of Requested Improvement (An example)
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- Lecture 105: PageRank: Revisited - An example
- Lecture 106: PageRank: Revisited - Convergence of the Example
- Lecture 107: PageRank: Revisited - Convergence and Convergence
- Lecture 108: PageRank: Revisited - Convergence and Convergence: Another example
- Lecture 109: Matrix Multiplication Prerequisite 1)
- Lecture 110: Convergence in Requested Matrix Multiplication Prerequisite 1)
- Lecture 111: Addition of Two Matrices Prerequisite 2)
- Lecture 112: Convergence in Requested Matrix Multiplication: The Example
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Week 8 : Assignment 8

The due date for submitting this assignment has passed.

Due on 2024-03-20, 23:58 IST.

Assignment submitted on 2024-03-19, 18:20 IST

1) Consider a vector  $u$  with a very high magnitude as compared to a vector  $v$ , comment on the direction of the resultant vector when  $u$  is added to  $v$ . 4 point

Based on Fig apply

☐ Same as  $u$

☒ Close to  $u$

☐ Independent of  $u$  and  $v$

☐ Opposite to  $u$

**Yes, the answer is correct.**

Score: 1

Accepted Answers

close to u

2) Which of the following statements best describes the concepts of 'hub' and 'authority'? (Select all that apply) 4 point

☒ The Authority update rule states that for each page  $p$ , update  $auth(p)$  is the sum of the hub scores of all pages that point to  $p$ .

☒ The Authority update rule states that for each page  $p$ , update  $auth(p)$  is the average of the hub scores of all pages that point to  $p$ .

☒ The hub update rule states that for each page  $p$ , update  $hub(p)$  is the sum of the authority scores of all pages that  $p$  points to.

☒ The hub update rule states that for each page  $p$ , update  $hub(p)$  is the max of the authority scores of all pages that  $p$  points to.

**Yes, the answer is correct.**

Score: 1

Accepted Answers

The Authority update rule states that for each page  $p$ , update  $auth(p)$  is the sum of the hub scores of all pages that point to  $p$ .  
The hub update rule states that for each page  $p$ , update  $hub(p)$  is the sum of the authority scores of all pages that  $p$  points to.

3) Consider the following directed graph, which of the following is/are correct for repeated request? 4 point

☒  $auth = 1 + 0 + 0 + 0$

☒  $hub = 0$

☒  $C = \frac{1}{3} (A + B + D) = \frac{1}{3}$

☒  $E = \frac{1}{2} (C + D)$

**Yes, the answer is correct.**

Score: 1

Accepted Answers

$auth = 1 + 0 + 0 + 0$   
 $hub = 0$   
 $C = \frac{1}{3} (A + B + D) = \frac{1}{3}$   
 $E = \frac{1}{2} (C + D)$

4) Let  $C$  be the unit circle with  $(0,1)$  as its origin in the XY-plane. Then  $A$ , the point at which the vector  $(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$  intersects  $C$ , is 4 point

☐  $(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$

☒  $(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$

☐  $(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$

☐  $(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$

**Yes, the answer is correct.**

Score: 1

Accepted Answers

$(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$

5) Assume that the current pagerank values of A, B, and C are 0.2, 0.4 and 0.4 respectively. What will be their pagerank values after convergence? 4 point

☐ 0.25, 0.25, 0.25

☐ 0.4, 0.2, 0.4

☒ 0.25, 0.4, 0.4

☐ 0.4, 0.4, 0.4

**Yes, the answer is correct.**

Score: 1

Accepted Answers

0.4, 0.25, 0.4

6) Which of the following statements is/are about a Markov matrix? 4 point

☒ All elements in a Markov matrix must be non-negative, and each column must sum to 1.

☐ A Markov matrix is always a square matrix.

☐ The determinant of a Markov matrix is always equal to 1.

☐ A Markov matrix can have negative elements as long as the row sums are equal.

**Yes, the answer is correct.**

Score: 1

Accepted Answers

All elements in a Markov matrix must be non-negative, and each column must sum to 1.

7) Which of the following statements are correct? 0 points

Statement 1: Applying a matrix on its eigenfunction only changes the direction of the eigenfunction.

Statement 2: Eigenfunctions of a matrix are linearly independent on each other.

☐ Only 1

☐ Only 2

☐ Both

☐ None

**Yes, the answer is incorrect.**

Score: 0

Accepted Answers

Both

8) What value of PageRank will the nodes 1, 2, 3, 4 of the given graph have after the second iteration if the initial value was 1/4 for each node? 4 points

☐ 0.25, 0.15, 0.25, 0.25

☐ 0.25, 0.15, 0.15, 0.15

☒ 0.15, 0.15, 0.15, 0.15

☐ 0.15, 0.15, 0.15, 0.15

**Yes, the answer is incorrect.**

Score: 0

Accepted Answers

0.25, 0.15, 0.15, 0.15

9) Given the graph as shown in the following figure, while calculating the pagerank using matrix multiplication method on this graph, how does the row matrix iteration look like? 4 point

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 1/2 & 0 & 0 & 1/4 \\ 1/2 & 1/2 & 0 & 1/4 \\ 0 & 1/2 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1/4 \\ 1/4 \\ 1/4 \\ 1/4 \end{bmatrix}$$

$$\begin{bmatrix} 1/2 & 0 & 0 & 1 \\ 0 & 1/2 & 0 & 1/4 \\ 1/2 & 0 & 0 & 1/4 \\ 0 & 1/2 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1/4 \\ 1/4 \\ 1/4 \\ 1/4 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 1/2 & 1/2 & 1 \\ 0 & 0 & 0 & 1/4 \\ 0 & 1/2 & 0 & 1/4 \\ 0 & 1/2 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1/4 \\ 1/4 \\ 1/4 \\ 1/4 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 & 0 & 0 \\ 1/2 & 0 & 0 & 1/2 \\ 1/2 & 1/2 & 0 & 0 \\ 0 & 1/2 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1/4 \\ 1/4 \\ 1/4 \\ 1/4 \end{bmatrix}$$

**Yes, the answer is correct.**

Score: 1

Accepted Answers

$$\begin{bmatrix} 0 & 0 & 0 & 1 \\ 1/2 & 0 & 0 & 1/4 \\ 1/2 & 1/2 & 0 & 1/4 \\ 0 & 1/2 & 1 & 0 \end{bmatrix} \begin{bmatrix} 1/4 \\ 1/4 \\ 1/4 \\ 1/4 \end{bmatrix}$$

10) What is the score value of authorship and hub (in respectively) for the node 4 in the following figure after applying 1 step from out-only computing (i.e., where  $a_i = 1/3$  Assume individual hub and authority of each node as 1) 4 point

☐  $auth = 1, hub = 3$

☐  $auth = 3, hub = 1$

☐  $auth = 4, hub = 2$

☐  $auth = 2, hub = 4$

**Yes, the answer is correct.**

Score: 1

Accepted Answers

$auth = 3, hub = 1$

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## Lecture 110 - Why do Normal Distributions Appear?

## Lecture 117 - Power Law emerges in WWW graphs

## Lecture 118 - Detecting the Presence of Power Law

## Lecture 119 - Rich-Get-Richer Phenomenon

## Lecture 120 - Summary So Far

## Lecture 121 - Implementing Rich-getting-richer Phenomenon (Barabasi-Albert Model)

## Lecture 122 - Implementing Rich-getting-richer Phenomenon (Barabasi-Albert Model)

## Lecture 123 - Implementing a Random Graph (Erdos-Renyi Model)

## Lecture 124 - Implementing a Random Graph (Erdos-Renyi Model)

## Lecture 125 - Forest Versus Random Removal of Nodes (Arack-Rovinsky)

## Week 9 Feedback Form, Social Networks

## Quiz: Week 9 - Assignment 9

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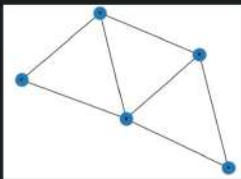
## Week 9 : Assignment 9

The due date for submitting this assignment has passed.

Due on 2024-03-27, 23:59 IST

Assignment submitted on 2024-03-27, 23:46 IST

1) Given a network being generated by 'rich get richer' phenomenon. Following figure shows the snapshot of a network at time  $t$ . A new node is added to the network at time  $t + 1$  and makes an edge with one of the existing nodes. If  $P(X)$  is the probability of the new node to form an edge with node  $X$ , which of the following is correct?



- ☐  $P(A) < P(D) < P(C)$   
☐  $P(A) < P(B) < P(D)$   
☐  $P(B) < P(D) < P(C)$   
☐  $P(A) < P(C) < P(D)$

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
 $P(A) < P(B) < P(D)$

2) Pick out the reason for Power Law Distribution in real world networks.

- ☐ Traffic closure  
☐ Hierarchical closure  
☐ Preferential attachment  
☐ Focal closure

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
Preferential attachment

3) Assume a set of 10 graphs are generated using Erdos-Renyi model with  $(n, p)$  parameters. Which of the following statements are True?

Statement 1 - Number of edges in all the graphs is the same  
Statement 2 - Number of edges in all the graphs may vary

- ☐ 1 only  
☐ 2 only  
☐ Both  
☐ None

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
1 only

4) Given set  $S = \{11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$ . We pick a value  $x_1$  uniformly at random from this set  $S$ . Next, we pick another value  $x_2$  again uniformly at random from this set  $S$ . Similarly we pick 5 more values,  $x_3, x_4, \dots, x_{10}$ . Look at the sum  $S' = x_1 + x_2 + \dots + x_{10}$ . Which of the following is true for the range of values of  $S'$ ?

- ☐  $\{11, 12, \dots, 200\}$   
☐  $\{110, 12, \dots, 200\}$   
☐  $\{11, 12, \dots, 2000\}$   
☐  $\{110, 12, \dots, 2000\}$

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
 $\{110, 12, \dots, 2000\}$

5) Pick out the correct representation of the Power Law.

- ☐  $y = x^2$   
☐  $y = x^{-2}$   
☐  $y = x^2$   
☐  $y = x^{-2}$   
☐  $y = x^2$   
☐  $y = x^{-2}$

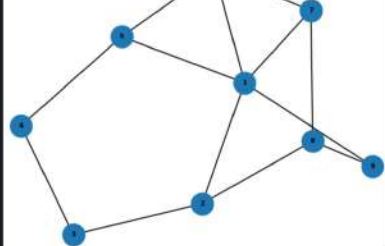
Yes, the answer is correct.  
Score: 0  
Accepted Answers:  
 $y = x^{-2}$

6) Consider a random graph with 600 nodes and edges between any two nodes with a probability of 0.2, where can one expect the peak of the degree-distribution graph?

- ☐ 300  
☐ 120  
☐ 900  
☐ 600

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
120

7) Consider the given graph, there is an incoming node  $F$ . To which node will this new node be added according to 'Rich get Richer' phenomenon?



- ☐ A  
☐ B  
☐ C  
☐ D

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
C

8) Which of the following correctly depicts the meaning of 'Marko' distribution of students in a class?

- ☐ Plot different mark values on the X-axis and the fraction/percentage of students having those marks on the Y-axis  
☐ Plot different mark values on the X-axis and the fraction/percentage of students having marks greater than those marks on the Y-axis  
☐ Plot different mark values on the X-axis and the fraction/percentage of students having marks less than those marks on the Y-axis  
☐ None of the above

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
Plot different mark values on the X-axis and the fraction/percentage of students having those marks on the Y-axis

9) Assume a random network  $A$ , where the nodes were removed randomly and assume a network  $B$  where the nodes are removed selectively. Which of the following is true for the results obtained in the demonstration?

Statement 1 - As the network is random, there is no preferential attachment of nodes in the network.  
Statement 2 - There are no hubs in random networks.

- ☐ 1 only  
☐ 2 only  
☐ Both  
☐ None

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
Both

10) Select the correct statements about the Barabasi-Albert (BA) model for scale-free networks. (Choose all that apply)

- ☐ Nodes are added randomly to the network  
☐ The BA model follows a preferential attachment mechanism  
☐ All nodes in the BA model have equal probabilities of forming connections  
☐ In the BA model, new nodes are more likely to connect to existing nodes with higher degrees

Yes, the answer is correct.  
Score: 1  
Accepted Answers:  
The BA model follows a preferential attachment mechanism  
In the BA model, new nodes are more likely to connect to existing nodes with higher degrees

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Lecture 126 - Rich Get Richer  
- A Possible Reason

Lecture 127 - Rich Get Richer  
- The Long Tail

Lecture 128 - Epidemics: An  
Introduction

Lecture 129 - Introduction to  
epidemics (contd.)

Lecture 130 - Simple  
Branching Process for  
Modeling Epidemics

Lecture 131 - Simple  
Branching Process for  
Modeling Epidemics (contd.)

Lecture 132 - Basic  
reproductive number

Lecture 133 - Modeling  
epidemics on complex  
networks

Lecture 134 - SIR and SIS  
spreading models

Lecture 135 - Comparison  
between SIR and SIS  
spreading models

Lecture 136 - Basic  
Reproductive Number  
Revisited for Complex  
Networks

Lecture 137 - Percolation  
model

Lecture 138 - Analysis of  
basic reproductive number in  
branching model (The  
problem statement)

Lecture 139 - Analyzing basic  
reproductive number 2

Lecture 140 - Analyzing basic  
reproductive number (3)

Lecture 141 - Analyzing basic  
reproductive number (4)

Lecture 142 - Analyzing basic  
reproductive number (5)

Week 10 Feedback Form:  
Social Networks

Quiz: Week 10 - Assignment  
10

## Week 11

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## Week 10 : Assignment 10

The due date for submitting this assignment has passed.

Due on 2024-04-03, 23:59 IST.

## Assignment submitted on 2024-04-03, 21:05 IST

1) Assume for a disease 'C'. People who are diagnosed in the earlier stage have a high chance of recovery. The recovered people do not have a chance to get infected again. What kind of model does this disease 'C' exhibit? **1 point**

- ☐ SIS  
☐ SIR  
☐ Both SIS and SIR  
☐ None

Yes, the answer is correct.

Score: 1

Accepted Answers:  
SIR

2) Which of the following statements is/are correct? **1 point**

Statement I - SIR model should come to an end after running for a finite number of steps on a network.  
Statement II - SIS model can keep running indefinitely on a network.

- ☐ I only  
☐ II only  
☐ Both  
☐ None

Yes, the answer is correct.

Score: 1

Accepted Answers:  
Both

3) Consider a Tree network to demonstrate infection transmission. If one node has 'k' children each and the probability of transmitting an infection is 'p', then the number of secondary infections is **1 point**

- ☐  $p \times k$   
☐  $p^k$   
☐  $\log p$   
☐  $\log p$

Yes, the answer is correct.

Score: 1

Accepted Answers:  
 $p \times k$

4) Suppose the basic reproductive number is estimated to be  $R_0 = 2.5$ . A vaccine providing a certain level of immunity is introduced and the new reproductive number is found to be  $R_1 = 1.5$ . What is the percentage of immunity provided by the vaccine? **1 point**

- ☐ 25%  
☐ 28%  
☐ 72%  
☐ 75%

Yes, the answer is correct.

Score: 1

Accepted Answers:  
28%

5) Which of the following is correct if the Basic reproductive number is less than 1? **1 point**

- ☐ the disease dies away with a probability 0  
☐ the disease dies away with a probability  $< 1$   
☐ the disease dies away with a probability 1  
☐ the disease persists with a probability 1

Yes, the answer is correct.

Score: 1

Accepted Answers:  
the disease dies away with a probability 1

6) Select the factors that affect the spread of a contagion. **1 point**

- ☐ density of the contact network  
☐ degree of contagiousness  
☐ both density of network and degree of contagiousness  
☐ none

Yes, the answer is correct.

Score: 1

Accepted Answers:  
both density of network and degree of contagiousness

7) In a city, an infection TOV is found to persist with a probability  $P > 0$ . Which of the following is/are the possible reproductive numbers? **1 point**

- ☐ 0.5  
☐ 1.1  
☐ 1.2  
☐ 1.5

Yes, the answer is correct.

Score: 1

Accepted Answers:  
1.1  
1.2  
1.5

8) In which of the following model does a node v become infected during the epidemic if and only if there is a path to v from one of the initially infected nodes that consists entirely of open edges? **1 point**

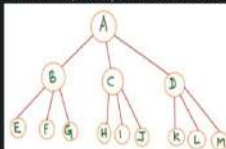
- ☐ SIR  
☐ SIS  
☐ Percolation  
☐ SER

Yes, the answer is correct.

Score: 1

Accepted Answers:  
Percolation

9) Consider the branching model for a 2 level tree shown in the following figure. Here, k (number of children for each node) = 3 and p(probability of infection) = 1/2. What is the probability that at least one of the nodes E,H and K are infected? **1 point**



- ☐ 1/8  
☐ 7/8  
☐ 37/64  
☐ 1/64

Yes, the answer is correct.

Score: 1

Accepted Answers:  
37/64

10) Given that the Reproductive number of an epidemic in action is 0.5. What are valid attempts to curb the disease? **0 points**

- ☐ 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  
☐ You can never curb the spread of the disease  
☐ The disease dies away even without intervention

Yes, the answer is correct.

Score: 0

Accepted Answers:  
The disease dies away even without intervention





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● Lecture 150: Programming illustration- Small world networks : Introduction

● Lecture 151: Base code

● Lecture 152: Making homophily-based edges

● Lecture 153: Adding weak ties

● Lecture 154: Plotting change in diameter

● Lecture 155: Programming illustration- Myopic Search : Introduction

● Lecture 156: Myopic Search

● Lecture 157: Myopic Search comparison to optimal search

● Lecture 158: Time Taken by Myopic Search

● Lecture 159: PseudoCores : Introduction

● Lecture 160: How to be Viral

● Lecture 161: Who are the right key nodes?

● Lecture 162: finding the right key nodes (the core)

● Lecture 163: Coding K-Shell Decomposition

● Lecture 164: Coding cascading Model

● Lecture 165: Coding the importance of core nodes in cascading

● Lecture 166: Pseudo core

● Week 12 Feedback Form: Social Networks

● Quiz: Week 12 : Assignment 12

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## Week 12 : Assignment 12

The due date for submitting this assignment has passed.

Due on 2024-04-17, 23:59 IST.

## Assignment submitted on 2024-04-17, 23:17 IST

1) Which of the following statements is true for Internet Memes?

1 point

- ☐ Internet memes are exclusively images and never involve text-based content.
- ☐ The virality of a meme is independent of its relatability and cultural relevance.
- ☐ Memes often spread through social networks, be it an image, audio, video or a file in some other format.
- ☐ Memes have a consistent and universal interpretation across diverse cultural backgrounds.

Yes, the answer is correct.

Score: 1

Accepted Answers:

Memes often spread through social networks, be it an image, audio, video or a file in some other format.

2) What is/are the factor(s) responsible for a meme to go viral?

1 point

- ☐ only quality of the meme
- ☐ only structure of the network
- ☐ Both quality of the meme and structure of the network
- ☐ Neither quality of the meme and structure of the network

Yes, the answer is correct.

Score: 1

Accepted Answers:

Both quality of the meme and structure of the network

3) What happens during the  $i^{\text{th}}$  iteration of k-shell decomposition algorithm?

1 point

- ☐ removes all nodes of degree  $i$
- ☐ removes all nodes of degree  $i$  recursively, so that there is no node with degree  $i$  any more
- ☐ removes all nodes of degree less than  $i$  recursively, so that there is no node with degree less than  $i$  any more
- ☐ removes all nodes of degree less than or equal to  $i$  recursively, so that there is no node with degree less than or equal to  $i$  any more

Yes, the answer is correct.

Score: 1

Accepted Answers:

removes all nodes of degree less than or equal to  $i$  recursively, so that there is no node with degree less than or equal to  $i$  any more

4) Which of the following statements is/are True?

1 point

Statement I - Core nodes of a network are removed in the last iteration of the k-shell decomposition algorithm

Statement II - Periphery nodes of a network are removed in the first iteration of the k-shell decomposition algorithm.

- ☐ I only
- ☐ II only
- ☐ Both
- ☐ None

Yes, the answer is correct.

Score: 1

Accepted Answers:

Both

5) Identify the node that has spreading capacity similar to the innermost core node but does not belong to the innermost core.

1 point

- ☐ pseudo-core
- ☐ periphery node
- ☐ core node
- ☐ hyper-core

Yes, the answer is correct.

Score: 1

Accepted Answers:

pseudo-core

6) A sub-graph of a graph is known as 4-core if

1 point

- ☐ Each node has a maximum degree of 4
- ☐ Each node has a degree strictly less than 4.
- ☐ Each node has a degree equal to 4.
- ☐ Each node has a degree greater than or equal to 4.

Yes, the answer is correct.

Score: 1

Accepted Answers:

Each node has a degree greater than or equal to 4.

7) Which of the following are True?

1 point

Statement I - Myopic search always performs as good as an Optimal search algorithm.

Statement II - Time taken for myopic search increases logarithmically with  $n$ .

- ☐ I only
- ☐ II only
- ☐ Both
- ☐ None

Yes, the answer is correct.

Score: 1

Accepted Answers:

II only

8) Identify the core which has the most influential people in the network.

1 point

- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5

Yes, the answer is correct.

Score: 1

Accepted Answers:

5

9) Which of the following is true for Decentralised search?

1 point

- ☐ Only one primary node performs the search
- ☐ The effort is shared across multiple nodes
- ☐ All nodes are involved in the search of every element
- ☐ The effort is on only two nodes - the primary and secondary node

Yes, the answer is correct.

Score: 1

Accepted Answers:

The effort is shared across multiple nodes

10) On a connected simple graph  $G$  we can measure the distance between two distinct vertices  $v_i$  and  $v_j$  as the number of edges on the shortest path between them. The diameter of a graph  $G$  is the maximum distance between any two distinct vertices in  $G$ . What is the diameter of a complete graph having  $n$  vertices?

1 point

- ☐ 0
- ☐ 1
- ☐  $n$
- ☐  $n-1$

Yes, the answer is correct.

Score: 1

Accepted Answers:

1