

## Unit 2 - Week 0

### Course outline

How does an NPTEL online course work?

### Week 0

Quiz : Assignment 0

### Week 1

### Week 2

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### Assignment Solutions

### Download Videos

## Assignment 0

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-01-27, 23:59 IST.

**Note :** This assignment is for practice and it will not be graded.

1) Which of the following is not a social networking site:

1 point

- Google+
- Instagram
- Bing
- Twitter

No, the answer is incorrect.

Score: 0

Accepted Answers:

Bing

2) Social Networking involves communication between \_\_\_\_\_ ?

1 point

- Two computers
- A computer and a router
- A human and a computer
- Two or more people

No, the answer is incorrect.

Score: 0

Accepted Answers:

Two or more people

3) An Internet meme is ( Choose the best answer ):

1 point

- A social networking website
- Any Website
- A computer virus
- Any kind of digital artefact traversing through the Internet, be it an image, audio, video or a file in some other format.

No, the answer is incorrect.

Score: 0

Accepted Answers:

Any kind of digital artefact traversing through the Internet, be it an image, audio, video or a file in some other format.

4) Which of the following is useful in traversing a given graph by breadth first search?

1 point

- Set
- List
- Stack
- Queue

No, the answer is incorrect.

Score: 0

Accepted Answers:

Queue

5) What is the maximum number of possible non-zero values in an adjacency matrix of a simple graph with n vertices?

1 point

- $(n*(n-1))/2$
- $(n*(n+1))/2$
- $n*(n-1)$
- $n*(n+1)$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$n*(n-1)$

6) On which of the following statements does the time complexity of checking if an edge exists between two particular vertices or not depends?

1 point

- Depends on the number of edges
- Depends on the number of vertices
- Is independent of both the number of edges and vertices
- It depends on both the number of edges and vertices

No, the answer is incorrect.

Score: 0

Accepted Answers:

Is independent of both the number of edges and vertices

7) Which type of graph has all the vertices of the first set connected to all the vertices of the second set?

1 point

- Bipartite
- Complete Bipartite
- Cartesian
- Pie

No, the answer is incorrect.

Score: 0

Accepted Answers:

Complete Bipartite

8) In a complete graph with n nodes, how many different triangles are present?

1 point

- $3n$
- $n^3$
- $(n^3-3n^2+2n)/6$
- None of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

$(n^3-3n^2+2n)/6$

9) In an undirected graph G with n vertices and e edges, the sum of the degrees of each vertex is:

1 point

- $n*e$
- $2n$
- $2e$
- $e^n$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$2e$

10) The number of edges in a regular graph of degree d and n vertices is (Assume n and d to be even):

1 point

- $nd$
- $(n+d)/2$
- $(nd)/2$
- Maximum of  $n,d$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$(nd)/2$

## Unit 3 - Week 1

### Course outline

How does an NPTEL 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 Networkx-1 (10 min)

○ Lecture 06 - Introduction to Networkx-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 Acquaintances (1 min)

○ Lecture 13 - Marketing on Social Networks (2 min)

○ Quiz : Assignment 1

○ Week 1 Feedback

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### Assignment Solutions

### Download Videos

## Assignment 1

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-02-12, 23:59 IST.

1) If  $a='Social'$ ,  $b='Networks'$  then which of the following operation would show 'SocialNetworks' as output? 1 point

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

No, the answer is incorrect.

Score: 0

Accepted Answers:

All of the above

2) What will be the output of the following Python code snippet? 1 point

```
a={1:"A",2:"B",3:"C"}  
print(a.get(1,4))
```

- 1
- A
- 4
- Invalid syntax of get() method

No, the answer is incorrect.

Score: 0

Accepted Answers:

A

3) What will be the output of the following Python code? 1 point

```
a={1:"A",2:"B",3:"C"}  
a.clear()  
print(a)
```

- None
- {None:None, None:None, None:None}
- {1:None, 2:None, 3:None}
- {}

No, the answer is incorrect.

Score: 0

Accepted Answers:

{}

4) Which of the following is true for variable names in Python? 1 point

- Variable names can be of any length
- All private members must have leading and trailing underscores
- Underscore and ampersand are the only two special characters allowed
- All of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

Variable names can be of any length

5) There are 25 telephones in Wonderland. Is it possible to connect them with wires so that each telephone is connected with exactly 7 others. 1 point

- Yes
- No

No, the answer is incorrect.

Score: 0

Accepted Answers:

No

6) Consider any group of two or more people, there are \_\_\_\_\_ people who have exactly the same number of friends inside the group. 1 point

- At least two
- Exactly two
- At least three
- None of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

At least two

7) The command networkx.info(G) doesn't give the following details about a graph G: 1 point

- Number of nodes
- Number of edges
- Connectedness
- Type of Graph: Graph/DiGraph

No, the answer is incorrect.

Score: 0

Accepted Answers:

Connectedness

8) In networkx, which function is used to get the neighbors of a node in a graph G? 1 point

- G.neighboring()
- G.adjacent()
- G.adjoining()
- None of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

None of the above

9) What is the output of the following code snippet? 1 point

```
import networkx as nx  
G = nx.Graph()  
G.add_edges_from([(1,2),(3,4),(5,6),(7,8),(2,8),(4,6)])  
G.remove_edges_from([(1,2),(3,4),(5,6)])  
print(len(G.nodes()))
```

- 2
- 4
- 6
- None of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

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

## Unit 4 - Week 2

### Course outline

How does an NPTEL online course work?

### Week 0

### Week 1

### Week 2

Lecture 14 - Introduction to Datasets

Lecture 15 - Ingredients Network

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 Networkx

Lecture 22 - Datasets: Analysing Using Gephi

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

Quiz : Assignment 2

Week 2 Feedback

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### Assignment Solutions

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## Assignment 2

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-02-12, 23:59 IST.

- 1) In the synonymy network of English language, we can traverse from the word 'LOVE' to 'HATE'. What can we say regarding the *relation* of synonymy **1 point** over English words?

- It is Reflexive only.
- It is equivalence.
- It is symmetric as well as reflexive.
- It is POSET.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*It is symmetric as well as reflexive.*

- 2) Which of the following is the most correct with respect to a social network graph? (Choose the best one): **1 point**

- It is always a complete graph
- It is always a connected graph
- It is most probably a connected graph
- It is most probably a disconnected graph

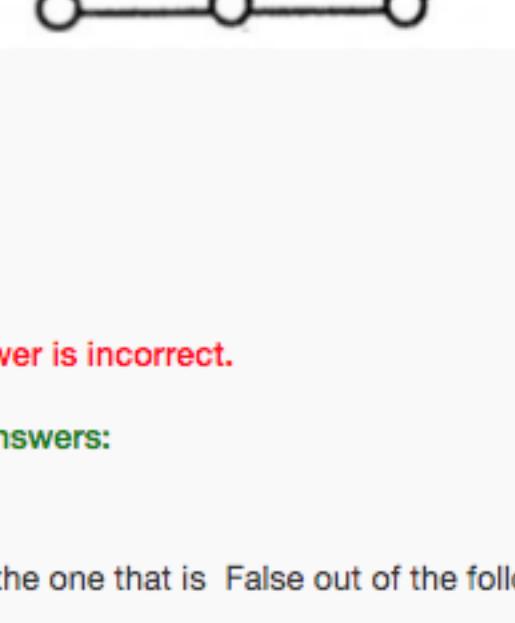
No, the answer is incorrect.

Score: 0

Accepted Answers:

*It is most probably a connected graph*

- 3) What is the density of the given graph? **1 point**



- 13/36
- 13/45
- 36/13
- 45/13

No, the answer is incorrect.

Score: 0

Accepted Answers:

*13/36*

- 4) Choose the one that is False out of the following: **1 point**

- GML stands for Graph Modeling Language.
- GML stores the data in the form of tags just like XML.
- GML and GraphML are different formats.
- Both GML and GraphML can store details of attributes of nodes and edges.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*GML stores the data in the form of tags just like XML.*

- 5) Which of the following formats was created as a part of Gephi project? **1 point**

- GML
- GEXF
- GraphML
- Pajek

No, the answer is incorrect.

Score: 0

Accepted Answers:

*GEXF*

- 6) Gephi is used for? (Choose the best option): **1 point**

- The analysis of networks
- The visualization of networks
- The analysis as well as visualization of networks
- For merging of network data sets.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*The analysis as well as visualization of networks*

- 7) Which of the following is not used as an extension for a network data set? **1 point**

- .net
- .txt
- .nitf
- .gdf

No, the answer is incorrect.

Score: 0

Accepted Answers:

*.nitf*

- 8) Which of the following network formats is the most unsuitable for adding attributes for edges? **1 point**

- GEXF format
- GML format
- Pajek Format
- Adjlist format

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Adjlist format*

- 9) The average clustering coefficient of a complete graph with 100 nodes will be? **1 point**

- 0
- 1
- 100
- 0.01

No, the answer is incorrect.

Score: 0

Accepted Answers:

*1*

- 10) 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

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Power Law*



## Unit 6 - Week 4

### Course outline

How does an NPTEL online course work?

#### Week 0

#### Week 1

#### Week 2

#### Week 3

#### Week 4

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 - Foci 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 Closures

Lecture 52 - Fatman Evolutionary Model- Implementing Social Influence

Lecture 53 - Fatman Evolutionary Model- Storing and analyzing longitudinal data

Quiz : Assignment 4

Week 4 Feedback

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### Assignment Solutions

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## Assignment 4

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-02-26, 23:59 IST.

- 1) Homophily refers to the friendship between people

1 point

- Who are introduced to each other because of a common friend
- Who are dissimilar to each other
- Who are similar to each other
- Who have different ethnicity but live at the same place

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Who are similar to each other*

- 2) Identify the type of Homophily in the following situation: "The followers of leaders such as Adolf Hitler accepted and often internalized the Nazi leader's fascist views without question."

1 point

- Social influence
- Selection
- Both A and B
- None of these

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Social influence*

- 3) Triadic closure implies that:

1 point

- Two people having a common enemy have more probability of becoming friends with each other.
- Three people having a common enemy have more probability of becoming friends with each other.
- Two people having a common friend have more probability of becoming friends with each other.
- Two people having a common person as a distant acquaintance have more probability of becoming friends with each other

No, the answer is incorrect.

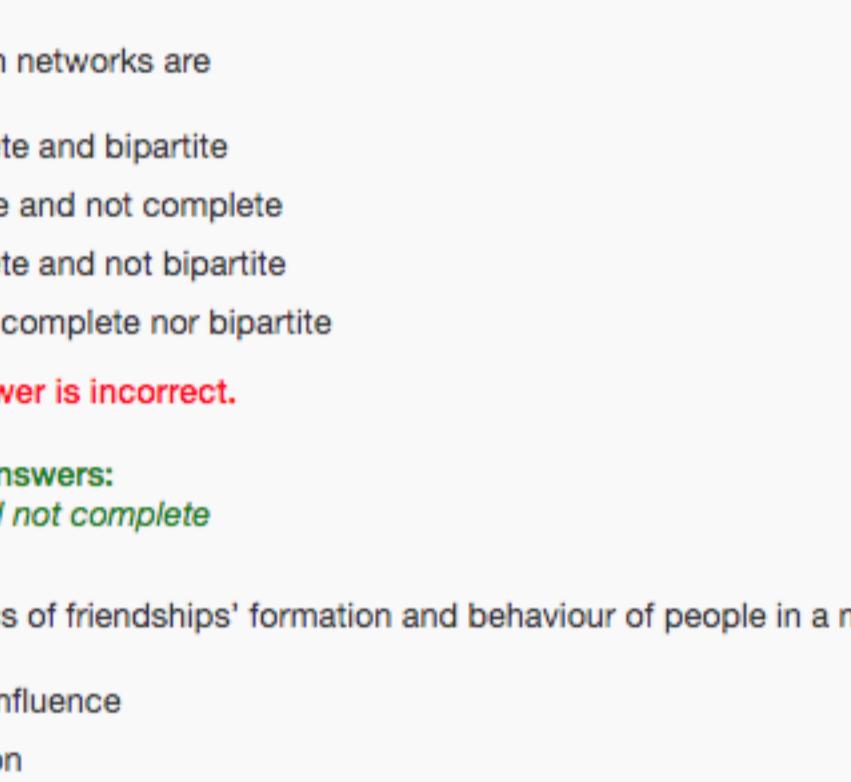
Score: 0

Accepted Answers:

*Two people having a common friend have more probability of becoming friends with each other.*

- 4) If in the given network, pink nodes represent females and white nodes represent males. Does the network exhibit homophily?

1 point



- Yes
- No Homophily
- Some evidence of homophily

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Some evidence of homophily*

- 5) Affiliation networks are

1 point

- Complete and bipartite
- Bipartite and not complete
- Complete and not bipartite
- Neither complete nor bipartite

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Bipartite and not complete*

- 6) Dynamics of friendships' formation and behaviour of people in a network is impacted by:

1 point

- Social Influence
- Selection
- Both selection and social influence
- Neither selection and social influence

No, the answer is incorrect.

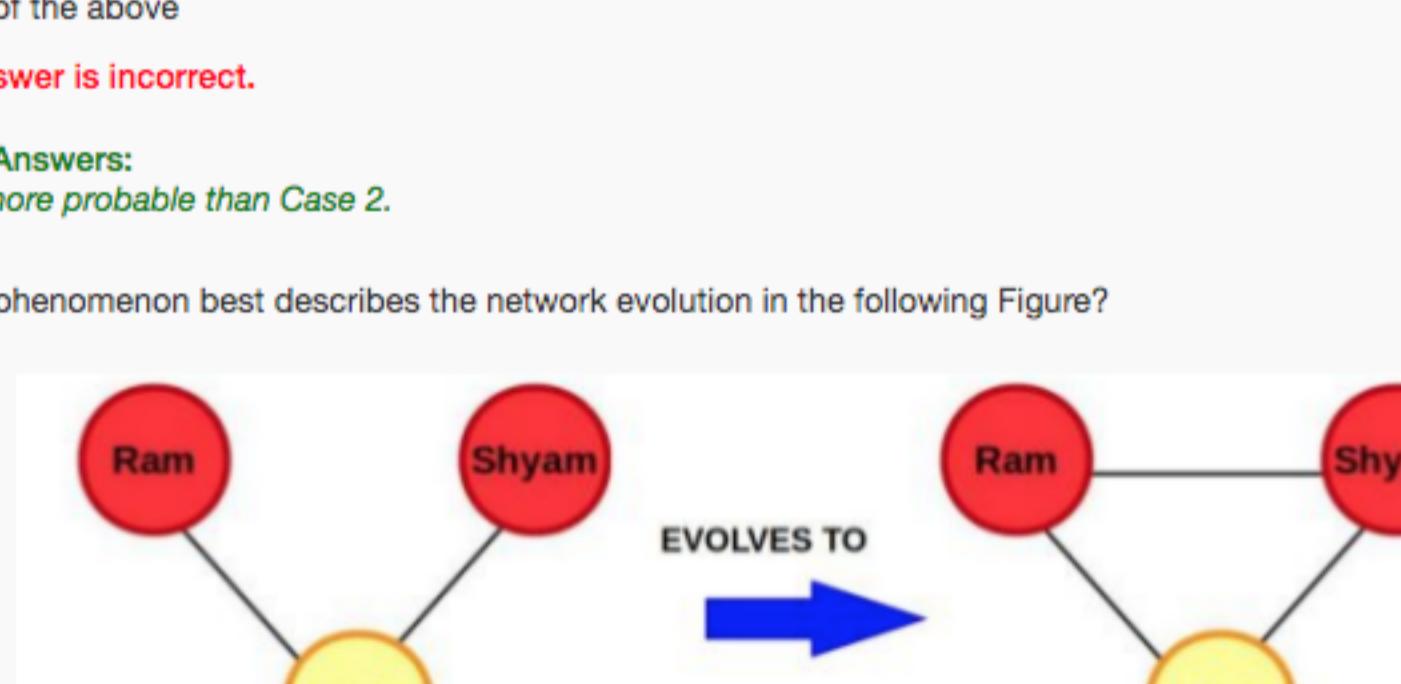
Score: 0

Accepted Answers:

*Both selection and social influence*

- 7) Given an affiliation graph in the following Figure that shows the membership of people in different social foci, researchers sometimes create a projected graph on just the people, in which they connect two people when they have a focus in common. When such a projected graph is created for the given figure, what would be the number of edges in it?

1 point



- 4
- 5
- 6
- 7

No, the answer is incorrect.

Score: 0

Accepted Answers:

*6*

- 8) Consider the following two cases:

1 point

Case 1: A and B become friends as they have 'n' common friends.

Case 2: X and Y become friends as they have 'n' common social foci. (where 'n' is a large number)

Choose the correct option from the following.

- Case 1 and Case 2 are equally probable.
- Case 2 is more probable than Case 1.
- Case 1 is more probable than Case 2.
- None of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Case 1 is more probable than Case 2.*

- 9) Which phenomenon best describes the network evolution in the following Figure?

1 point



- Homophily
- Triadic Closure
- Foci Closure
- Membership Closure

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Foci Closure*

- 10) Suppose Akash and Bhumi have 'k' common friends. Given that each common friend gives Akash and Bhumi an independent probability 'p' of forming a link, what is the probability that there will NOT exist a link between Akash and Bhumi?

1 point

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

No, the answer is incorrect.

Score: 0

Accepted Answers:

*$(1-p)^k$*

## Unit 7 - Week 5

### Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

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Week 5

• Lecture-54: Spatial Segregation: An Introduction

• 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 boundary and internal nodes

○ Lecture 60- Schelling Model Implementation - Getting a list of unsatisfied nodes

○ Lecture 61- Schelling Model Implementation - Shifting the unsatisfied 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 triangles

○ Lecture 71- Moving 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

○ Quiz : Assignment 5

○ Week 5 Feedback

Week 6

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Assignment Solutions

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## Assignment 5

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-03-04, 23:59 IST.

- 1) In a graph having 'n' nodes, how many possible triangles can be present? 1 point

- $n^3$
- 3n
- $(n(n-1)(n-2))/6$
- None of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

*(n(n-1)(n-2))/6*

- 2) What can we say about the stability/balance of K6 (complete graph on 6 nodes) having all edges -ve, with one random edge being positive? (Choose the most appropriate): 1 point

- It is a stable graph.
- It is an unstable graph but it will have exactly four balanced triangles.
- It is an unstable graph but it will have exactly six balanced triangles.
- It is an unstable graph but it will have only one balanced triangle.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*It is an unstable graph but it will have exactly four balanced triangles.*

- 3) In a graph having 8 nodes, how many possible edges can be present? 1 point

- 28
- 36
- 56
- 58

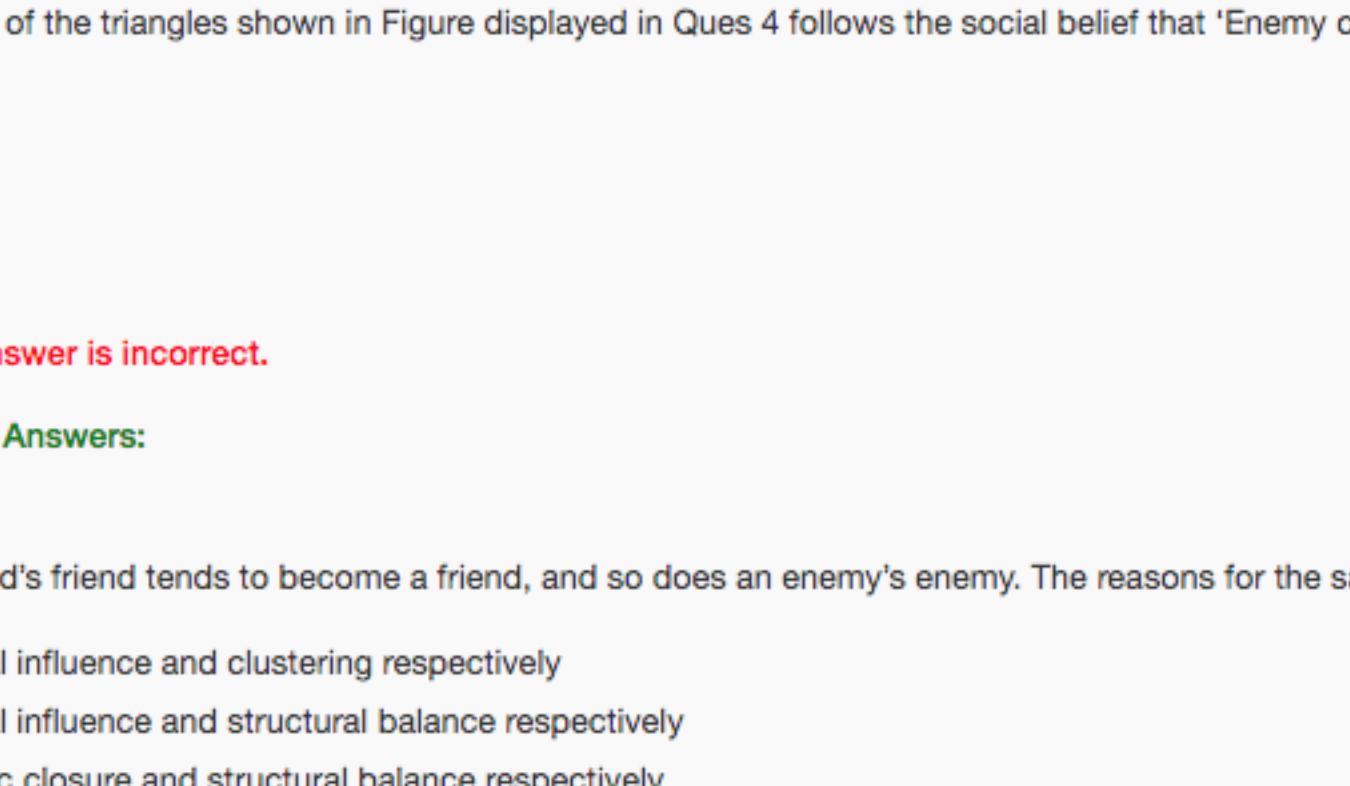
No, the answer is incorrect.

Score: 0

Accepted Answers:

*28*

- 4) Which of the following graphs are stable? 1 point



- (b) & (d) ONLY
- (a) & (c) ONLY
- (c) & (d) ONLY
- (a) & (b) ONLY

No, the answer is incorrect.

Score: 0

Accepted Answers:

*(a) & (b) ONLY*

- 5) Which of the triangles shown in Figure displayed in Ques 4 follows the social belief that 'Enemy of my enemy is my friend' ? 1 point

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.

Score: 0

Accepted Answers:

*(b)*

- 6) A friend's friend tends to become a friend, and so does an enemy's enemy. The reasons for the same are 1 point

- Social influence and clustering respectively
- Social influence and structural balance respectively
- Triadic closure and structural balance respectively
- Triadic closure and clustering respectively

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Triadic closure and structural balance respectively*

- 7) A signed graph is balanced if and only if it contains no cycle with 1 point

- An even number of negative edges
- An odd number of negative edges
- An even number of positive edges
- An odd number of positive edges

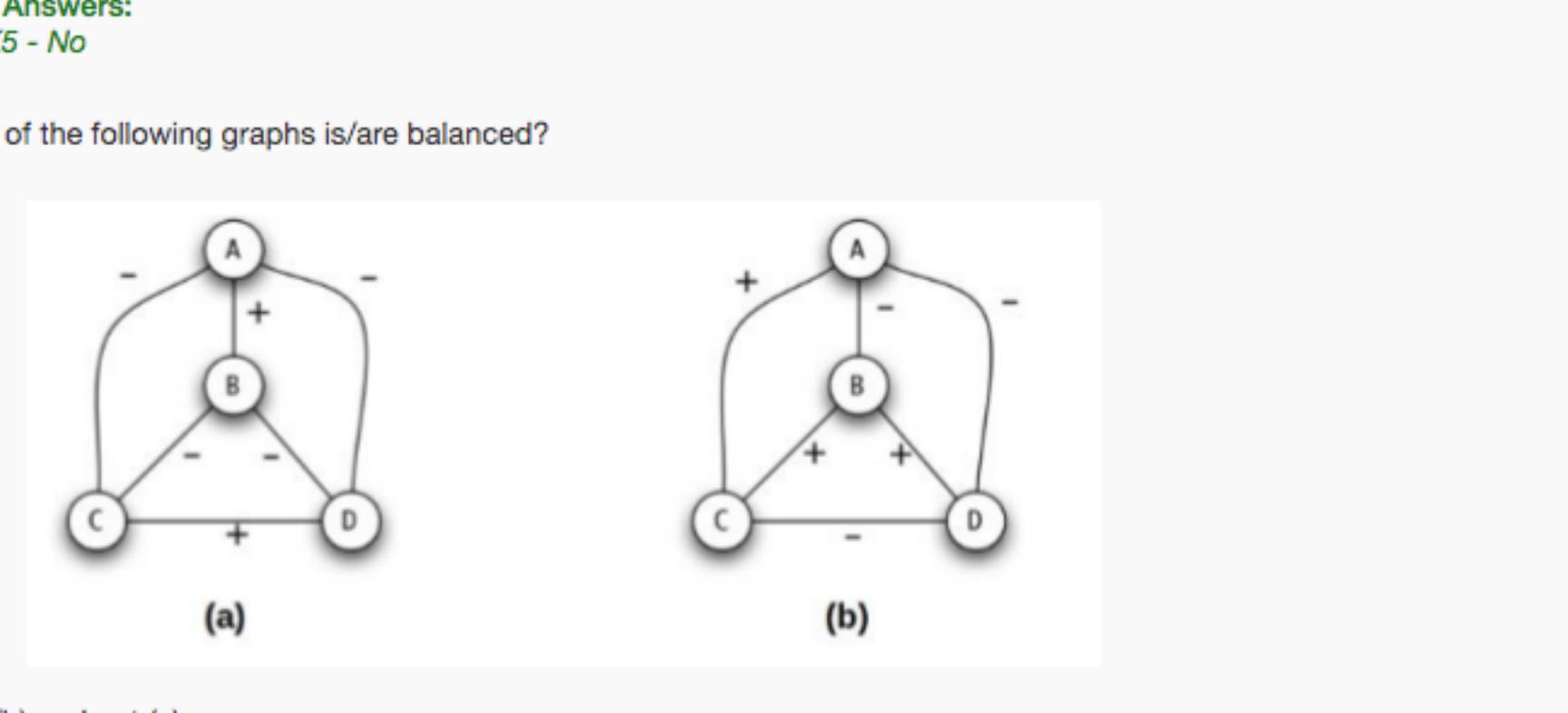
No, the answer is incorrect.

Score: 0

Accepted Answers:

*An odd number of negative edges*

- 8) Which of the following structures of graphs is/are balanced? 1 point



- Both (a) and (c)
- Only (a)
- Only (b)
- Both (b) and (d)

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Only (a)*

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

- K4 - Yes, K5 - Yes
- K4 - Yes, K5 - No
- K4 - No, K5 - Yes
- K4 - No, K5 - No

No, the answer is incorrect.

Score: 0

Accepted Answers:

*K4 - No, K5 - No*

- 10) Which of the following graphs is/are balanced? 1 point



- Only (b) and not (a)
- Neither (a) nor (b)
- Both (a) and (b)
- Only (a) and not (b)

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Only (a) and not (b)*

## Unit 8 - Week 6

### Course outline

How does an NPTEL online course work?

#### Week 0

#### Week 1

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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

Quiz : Assignment 6

Week 6 Feedback

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### Assignment Solutions

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## Assignment 6

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-03-11, 23:59 IST.

1) Web graph is

1 point

- Undirected and acyclic
- Directed and acyclic
- Undirected and cyclic
- Directed and can be cyclic/acyclic

No, the answer is incorrect.

Score: 0

Accepted Answers:

Directed and can be cyclic/acyclic

2) Consider algorithm 1 to be equal sharing coin distribution game and algorithm 2 to be random dropping coin distribution game.

1 point

Which of the following is true?

- Algorithm 1 ranks the nodes in ascending order of their importance while algorithm 2 ranks the nodes in descending order of importance.
- Both the algorithms rank the nodes in descending order of their importance but give different results.
- Algorithm 1 ranks the nodes in descending order of their importance while algorithm 2 ranks the nodes in ascending order of importance.
- Both the algorithms rank the nodes in descending order of their importance and give the same result.

No, the answer is incorrect.

Score: 0

Accepted Answers:

Both the algorithms rank the nodes in descending order of their importance and give the same result.

3) Consider algorithm 1 to be equal sharing coin distribution game and algorithm 2 to be random dropping coin distribution game.

1 point

Which of the following is true?

- Both the algorithms converge.
- None of the algorithms converge.
- Algorithm A converges while Algorithm B does not converge.
- Algorithm B converges while Algorithm A does not converge.

No, the answer is incorrect.

Score: 0

Accepted Answers:

Both the algorithms converge.

4) Which of the following is the most efficient way of obtaining the big web graph containing billions of nodes

1 point

- Searching for every single web page on Internet
- Random walk
- Breadth First Traversal
- depth First Traversal

No, the answer is incorrect.

Score: 0

Accepted Answers:

Random walk

5) Let  $\log_2(10) = 3.3$  and the number of atoms in the explored universe be  $10^{80}$ . Then, pick the largest number of nodes from the below given options such that the number of possible graphs (undirected and without loops) on that many nodes is smaller or equal to the number of atoms in the explored universe.

1 point

- 25
- 24
- 23
- 22

No, the answer is incorrect.

Score: 0

Accepted Answers:

23

6) In link analysis, teleportation is the process of jumping to a node . . . . .

1 point

- chosen randomly when there are no out-edges
- having highest in-degree when there are no in-edges
- having lowest out-degree when there are no out-edges
- chosen randomly when there are no in-edges

No, the answer is incorrect.

Score: 0

Accepted Answers:

chosen randomly when there are no out-edges

7) Consider the graph shown in the following Figure. The number written in each circle represents the number of gold coins possessed by the corresponding node. Choose the number of gold coins every node has in the next iteration, according to the equal sharing gold 'coins' game.

1 point



- A: 30, B: 30, C: 30, D: 40
- A: 30, B: 40, C: 30, D: 30
- A: 40, B: 40, C: 30, D: 40
- A: 30, B: 40, C: 50, D: 10

No, the answer is incorrect.

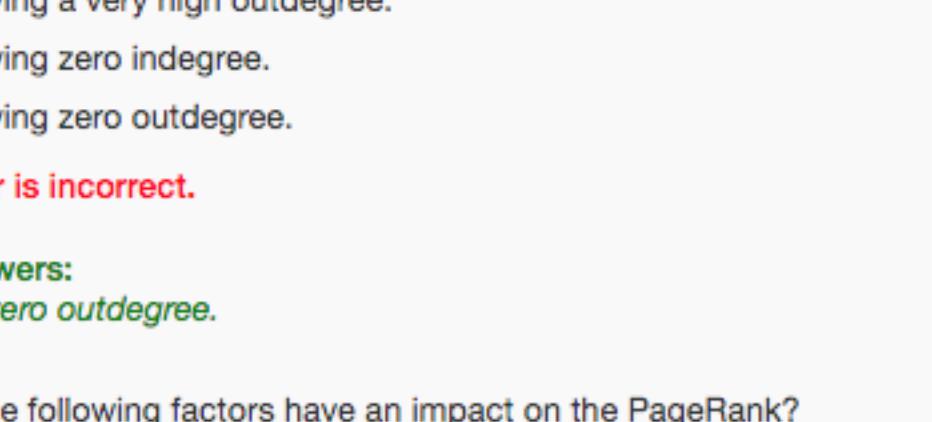
Score: 0

Accepted Answers:

A: 30, B: 40, C: 30, D: 30

8) For what values of pageranks of the nodes in the following Figure does the process converge, i.e. pageranks of the nodes do not change after this configuration?

1 point



- Node 1: 1/5, Node 2: 1/5, Node 3: 1/5, Node 4: 1/5, Node 5: 1/5
- Node 1 : 1/5, Node 2 : 1/5, Node 3 : 2/5, Node 4: 1/10, Node 5: 1/10
- Node 1: 3/10, Node 2: 1/10, Node 3: 1/10, Node 4 : 2/10, Node 5: 3/10
- Node 1: 1/10, Node 2: 3/10, Node 3: 2/10, Node 4: 1/10, Node 5: 3/10

No, the answer is incorrect.

Score: 0

Accepted Answers:

Node 1: 3/10, Node 2: 1/10, Node 3: 1/10, Node 4 : 2/10, Node 5: 3/10

9) Which of the following kinds of nodes might create a problem in the random walk (drop) gold coins' distribution game?

1 point

- Nodes having a very high indegree.
- Nodes having a very high outdegree.
- Nodes having zero indegree.
- Nodes having zero outdegree.

No, the answer is incorrect.

Score: 0

Accepted Answers:

Nodes having zero outdegree.

10) Which of the following factors have an impact on the PageRank?

1 point

- The total number of inbound links to a page of a web site.
- The subject matter of the site providing the inbound link to a page of a web site.
- The text used to describe the inbound link to a page of a web site.
- The number of outbound links on the page that contains the inbound link to a page of a website.

No, the answer is incorrect.

Score: 0

Accepted Answers:

The total number of inbound links to a page of a web site.

## Unit 9 - Week 7

### Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Lecture 87 - We Follow

Lecture 88 - Why do we Follow?

Lecture 89 - Diffusion in Networks

Lecture 90 - Modeling Diffusion

Lecture 91- Modeling Diffusion (Continued)

Lecture 92 - Impact of Communities on Diffusion

Lecture 93 - Cascade and Clusters

Lecture 94 - Knowledge, Thresholds and the Collective Action

Lecture 95 - An Introduction to the Programming Screencast (Coding 4 major ideas)

Lecture 96 - The Base Code

Lecture 97 - Coding the First Big Idea - Increasing the Payoff

Lecture 98 - Coding the Second Big Idea - Key People

Lecture 99 - Coding the Third Big Idea - Impact of Communities on Cascades

Lecture 100 - Coding the Fourth Big Idea - Cascades and Clusters

Quiz : Assignment 7

Week 7 Feedback

Week 8

Week 9

Week 10

Week 11

Week 12

Assignment Solutions

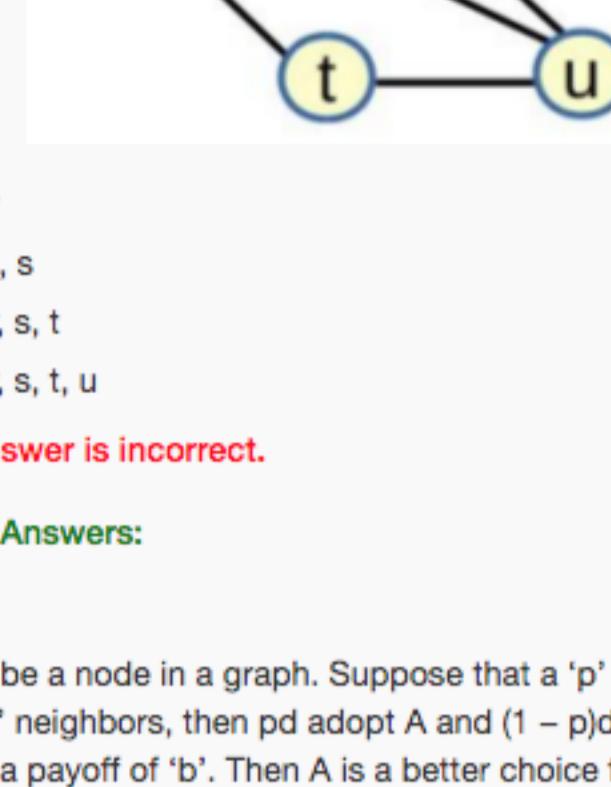
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## Assignment 7

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-03-18, 23:59 IST.

- 1) 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 'v' and 'w' are the initial adopters of this behavior A, i.e., nodes 'v' and 'w' now have adopted behavior A and the rest of the nodes have adopted behavior B. The payoff associated with A is  $a = 3$  and the payoff associated with B is  $b = 2$ . 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. After two iterations, which nodes would have adopted the behavior A?



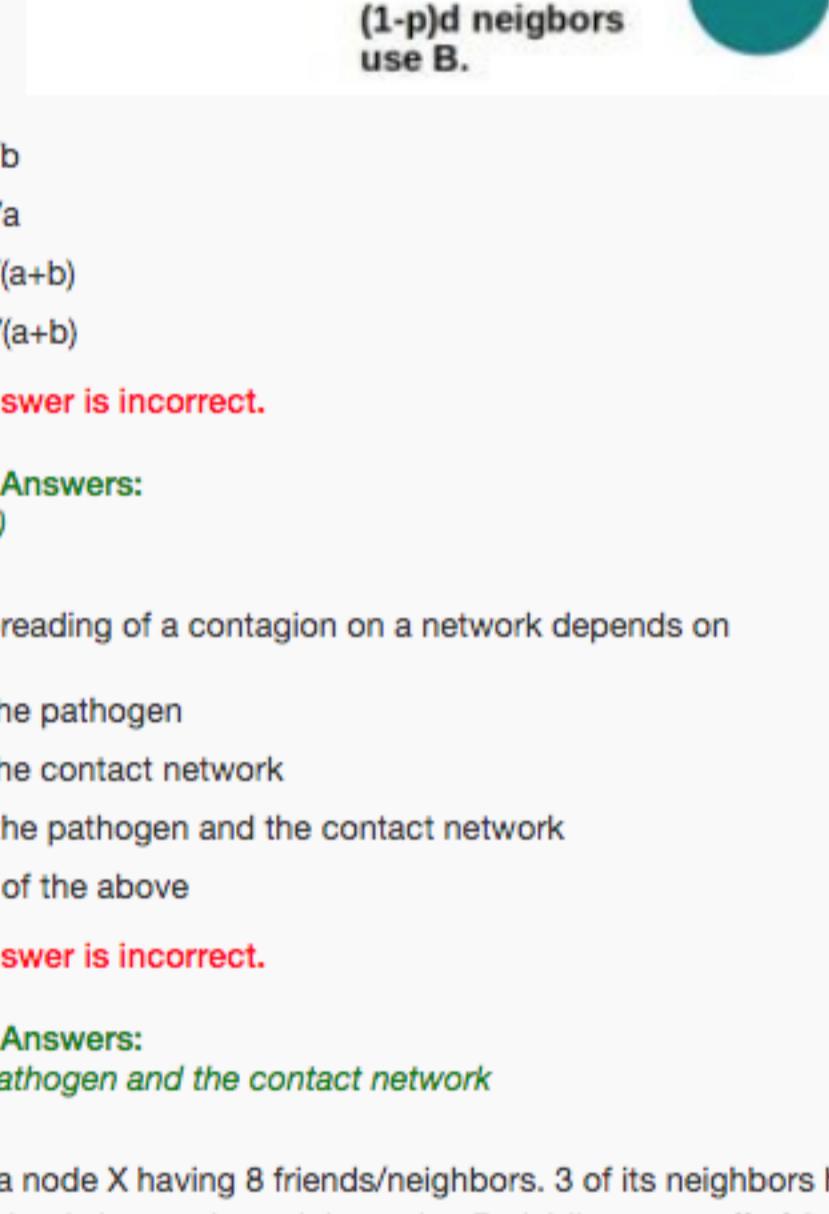
- v, w, r  
 v, w, t, s  
 v, w, r, s, t  
 v, w, r, s, t, u

No, the answer is incorrect.  
Score: 0

Accepted Answers:

v, w, t, s

- 2) Let 'v' be a node in a graph. Suppose that a ' $p$ ' fraction of the neighbors of 'v' have behavior A, and a  $(1-p)$  fraction have behavior B; that is, if 'v' has ' $d$ ' neighbors, then  $pd$  adopt A and  $(1-p)d$  adopt B, as shown in the following Figure. Behavior A has a payoff of ' $a$ ' and behavior B has a payoff of ' $b$ '. Then A is a better choice for 'v' if



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

No, the answer is incorrect.

Score: 0

Accepted Answers:

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

- 3) The spreading of a contagion on a network depends on

- only the pathogen  
 only the contact network  
 both the pathogen and the contact network  
 None of the above

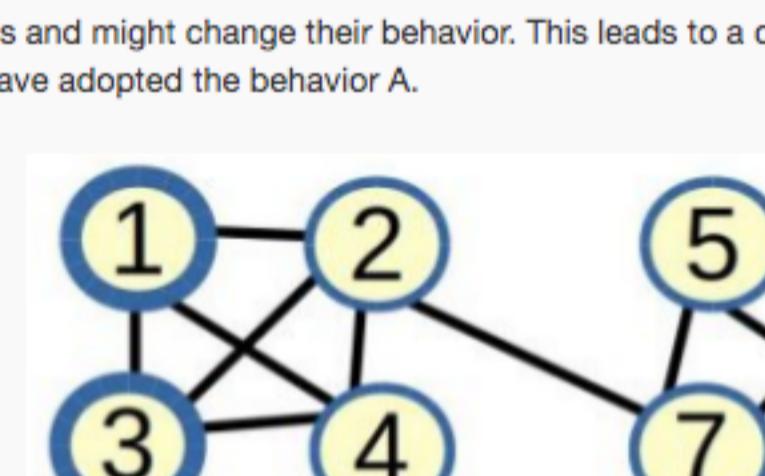
No, the answer is incorrect.

Score: 0

Accepted Answers:

both the pathogen and the contact network

- 4) Given a node X having 8 friends/neighbors. 3 of its neighbors have decided to adopt the behavior/action A having a payoff of 11 while 5 of its friends have adopted the action B yielding a payoff of 6. This is shown in the following Figure. What is (i) the payoff that X gets from its friends who have adopted the action A, (ii) the payoff that X gets from its friends who have adopted B, (iii) The final action/behavior adopted by X?



- (i) 33 , (ii) 30, (iii) B  
 (i) 33 , (ii) 30, (iii) A  
 (i) 11 , (ii) 6, (iii) A  
 (i) 11 , (ii) 6, (iii) B

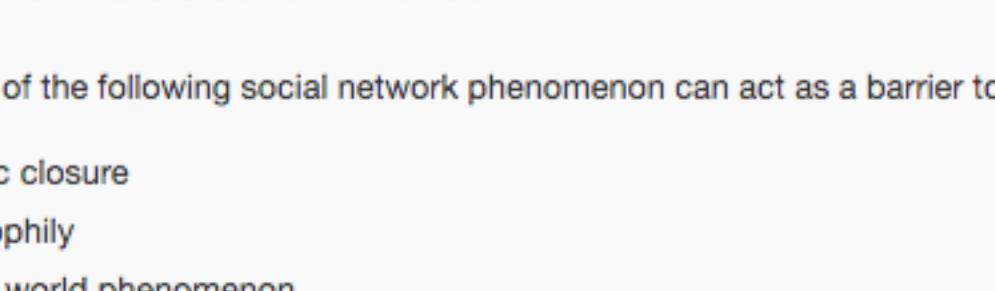
No, the answer is incorrect.

Score: 0

Accepted Answers:

(i) 33 ,(ii) 30, (iii) A

- 5) 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 1 and 3 are the initial adopters of this behavior A, i.e., nodes 1 and 3 now have adopted behavior A and the rest of the nodes have adopted behavior B. The payoff associated with A is  $a = 3$  and the payoff associated with B is  $b = 2$ . 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 the nodes who have adopted the behavior A.



- 1, 3, 2  
 1, 3, 2, 4  
 1, 3, 2, 4, 7  
 1, 3, 2, 4, 5, 6, 7, 8

No, the answer is incorrect.

Score: 0

Accepted Answers:

1, 3, 2, 4

- 6) Consider a set of initial adopters of behavior A, with a threshold of  $q$  for nodes in the remaining network to adopt behavior A. Given the following two statements.

Statement 1: If the remaining network contains a cluster of density greater than  $1 - q$ , then the set of initial adopters will not cause a complete cascade.

Statement 2: Whenever a set of initial adopters does not cause a complete cascade with threshold  $q$ , the remaining network must contain a cluster of density greater than  $1 - q$ . Choose the correct option from the following.

- Both Statement 1 and Statement 2 are true.  
 Both Statement 1 and Statement 2 are false.  
 Statement 1 is true but Statement 2 is false.  
 Statement 2 is true but Statement 1 is false.

No, the answer is incorrect.

Score: 0

Accepted Answers:

Both Statement 1 and Statement 2 are true.

- 7) Which of the following social network phenomenon can act as a barrier to the diffusion of an innovation?

- Triadic closure  
 Homophily  
 Small world phenomenon  
 Core-Periphery structure

No, the answer is incorrect.

Score: 0

Accepted Answers:

Homophily

1 point

## Unit 10 - Week 8

### Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Lecture 101 : Introduction to Hubs and Authorities (A Story)

Lecture 102: Principle of Repeated Improvement (A story)

Lecture 103: Principle of Repeated Improvement (An example)

Lecture 104 : Hubs and Authorities

Lecture 105 : PageRank Revised - An Example

Lecture 106: PageRank Revised - Convergence in the Example

Lecture 107 : PageRank Revisited - Conservation and Convergence

Lecture 108: PageRank, conservation and convergence - Another example

Lecture 109 : Matrix Multiplication (Pre-requisite 1)

Lecture 110: Convergence in Repeated Matrix Multiplication (Pre-requisite 1)

Lecture 111 : Addition of Two Vectors (Pre-requisite 2)

Lecture 112 : Convergence in Repeated Matrix Multiplication- The Details

Lecture 113 : PageRank as a Matrix Operation

Lecture 114 : PageRank Explained

Quiz : Assignment 8

Week 8 Feedback

Week 9

Week 10

Week 11

Week 12

Assignment Solutions

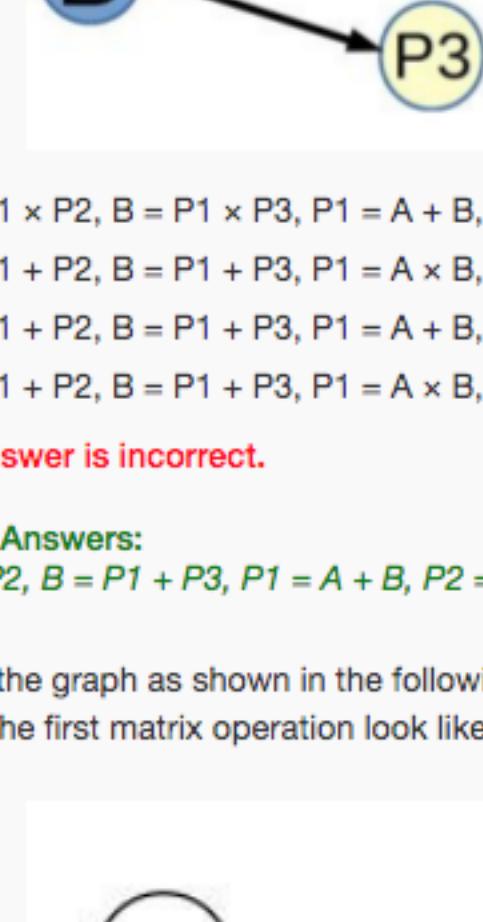
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## Assignment 8

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-03-25, 23:59 IST.

- 1) Observe the graph shown in the following Figure. According to the principle of repeated improvement, which of the following is correct? 1 point



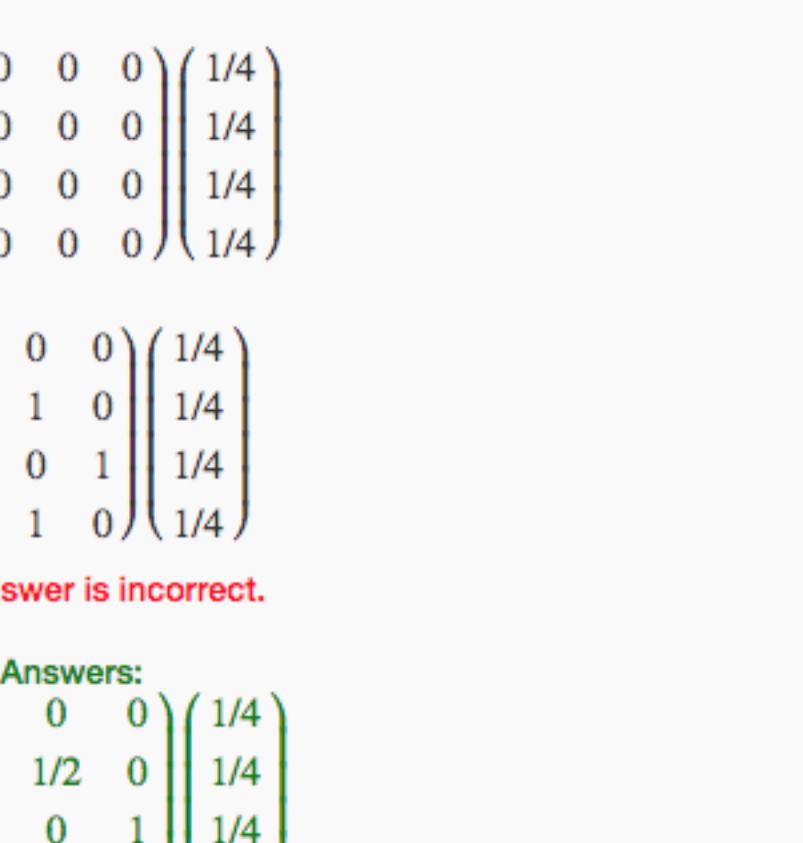
- A = P1 × P2, B = P1 × P3, P1 = A + B, P2 = A, P3 = B  
 A = P1 + P2, B = P1 + P3, P1 = A × B, P2 = A, P3 = B  
 A = P1 + P2, B = P1 + P3, P1 = A + B, P2 = A, P3 = B  
 A = P1 + P2, B = P1 + P3, P1 = A × B, P2 = 0, P3 = 0

No, the answer is incorrect.

Score: 0

Accepted Answers:  
A = P1 + P2, B = P1 + P3, P1 = A + B, P2 = A, P3 = B

- 2) Given the graph as shown in the following Figure, while calculating the pagerank using matrix multiplication method on this graph, how does the first matrix operation look like? 1 point



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

No, the answer is incorrect.

Score: 0

Accepted Answers:  
non-symmetric, symmetric

- 3) In a digraph, the adjacency matrix A is generally \_\_\_\_\_, however, the two matrices used in the HITS algorithm ( $A^T A$  and  $AA^T$ ) are \_\_\_\_\_. 1 point

- non-symmetric, symmetric  
 symmetric, non-symmetric  
 Diagonal, identity  
 Identity, diagonal

No, the answer is incorrect.

Score: 0

Accepted Answers:  
non-symmetric, symmetric

- 4) When we add two vectors in the XY plane, where one vector has a very high magnitude as compared to the other, then the resultant vector is closer towards (in terms of direction) to 1 point

- the bigger vector  
 the smaller vector  
 origin  
 none of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:  
the bigger vector

- 5) Which option is true in social networks: 1 point

- Authorities represent resources while Hubs represent pointers to resources  
 Hubs represent resources while Authorities represent pointers to resources  
 Both hubs and Authorities represent pointers to resources  
 none of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:  
Authorities represent resources while Hubs represent pointers to resources

- 6) In Hubs and Authorities algorithm, the authority update rule is defined as 1 point

- For each page p, update auth(p) to be the sum of the authority scores of all pages that it points to.  
 For each page p, update auth(p) to be the sum of the hub scores of all pages that it points to.  
 For each page p, update auth(p) to be the sum of the authority scores of all pages that points to it.  
 For each page p, update auth(p) to be the sum of the hub scores of all pages that point to it.

No, the answer is incorrect.

Score: 0

Accepted Answers:  
For each page p, update auth(p) to be the sum of the hub scores of all pages that point to it.

- 7) What is the score value of authority(a) and hub(h) respectively for node 4 in the following figure after applying 1-step hub-authority computation (i.e. when k is 1)? 1 point



- a(1) = 9, h(1) = 0  
 a(1) = 0, h(1) = 9  
 a(1) = 0, h(1) = 3  
 a(1) = 3, h(1) = 0

No, the answer is incorrect.

Score: 0

Accepted Answers:  
a(1) = 3, h(1) = 0

- 8) In a Markov matrix 1 point

- The sum of elements in every row is 1.  
 The sum of elements in every column is 1.  
 The sum of diagonal elements is 1.  
 None of the above.

No, the answer is incorrect.

Score: 0

Accepted Answers:  
The sum of elements in every column is 1.

- 9) Highest eigenvalue of a Markov matrix is 1 point

- Equal to the number of rows  
 10  
 1  
 Equal to the number of columns

No, the answer is incorrect.

Score: 0

Accepted Answers:  
1

- 10) Assume the shown pageranks for the given nodes at some point of time. Find the page rank score of web pages B and D in the next iteration: 1 point



- 18, 28  
 9, 16  
 18, 22  
 Insufficient data

No, the answer is incorrect.

Score: 0

Accepted Answers:  
9, 16

## Unit 11 - Week 9

### Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Lecture 115 - Introduction to Power Law

Lecture 116 - 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)-1

Lecture 122 - Implementing Rich-getting-richer Phenomenon (Barabasi-Albert Model)-2

Lecture 123 - Implementing a Random Graph (Erdos- Renyi Model)-1

Lecture 124 - Implementing a Random Graph (Erdos- Renyi Model)-2

Lecture 125 - Forced Versus Random Removal of Nodes (Attack Survivability)

Quiz : Assignment 9

Week 9 Feedback

Week 10

Week 11

Week 12

Assignment Solutions

Download Videos

## Assignment 9

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-04-01, 23:59 IST.

- 1) Which of the following is true for  $G(1000, 0.5)$  random network:
- The density of the network will be 0.5
  - The clustering coefficient will be 0.5
  - Each node will be added with probability 0.5.
  - Each edge will be placed with probability 0.5 .

No, the answer is incorrect.

Score: 0

Accepted Answers:

Each edge will be placed with probability 0.5 .

- 2) Given set  $E = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ , we pick a value  $a_1$  uniformly at random from this set E. Next, we pick another value  $a_2$  , again uniformly at random from this set E. Similarly we pick 8 more values,  $a_3, a_4, \dots, a_{10}$ . Look at the sum  $S = a_1 + a_2 + \dots + a_{10}$ . Let  $p(i)$  be the probability that  $S = i$ , i.e., the probability that the sum of these randomly chosen 10 elements is i. We plot i on the X-axis and  $p(i)$  on the Y axis. Choose the correct statement from the following:

- The plot has very high values in the beginning but then drops.
- The plot is a constant curve.
- The plot is a bell shaped curve.
- The plot is linear.

No, the answer is incorrect.

Score: 0

Accepted Answers:

The plot is a bell shaped curve.

- 3) Power law degree distribution in real world networks generally follows the characteristic equation  $y = 1/k^a$  . What is the value of 'a' here?

- $1 < a < 2$
- $2 < a < 3$
- $3 < a < 4$
- None of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

$2 < a < 3$

- 4) How does the power law degree distribution come by in real world networks?:

- By preferential attachment
- By random linking
- By uniform edge connection
- No hypothesis is found.

No, the answer is incorrect.

Score: 0

Accepted Answers:

By preferential attachment

- 5) In the preferential attachment, a new coming node will prefer to make the connection with the node having:

- Fewer friends
- More friends
- Average number of friends
- None of the above

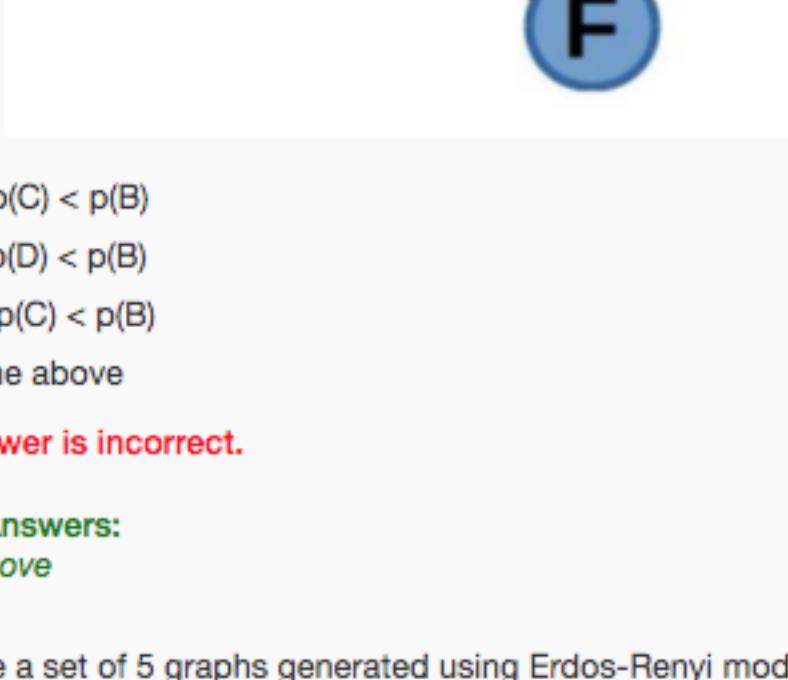
No, the answer is incorrect.

Score: 0

Accepted Answers:

More friends

- 6) Given a network being generated by 'rich get richer' phenomenon. The following Figure shows the snapshot of the network at time t. A new node 'u' enters the network at time  $t+1$  and makes an edge with one of the existing nodes. The probability of 'u' making an edge with an existing node 'w' is defined as  $p(w)$ . Which of the following equations is correct?



- $p(A) < p(C) < p(B)$
- $p(E) < p(D) < p(B)$
- $p(F) < p(C) < p(B)$
- All of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

All of the above

- 7) Let G be a set of 5 graphs generated using Erdos-Renyi model with  $(n, p)$  parameters. Similarly, let H be a set of 5 graphs generated using Barabasi-Albert model with  $(n, m)$  parameters. Which of the following is true (Assume standard definitions for n, m and p):

- No. of edges in all the graphs in G is same, the no. of edges in all the graphs in H may vary.
- No. of edges in all the graphs in H is same, the no. of edges in all the graphs in G may vary.
- No. of edges in all the graphs in G is same, No. of edges in all the graphs in H is same
- No. of edges in all the graphs in both, G and H, varies in each iteration

No, the answer is incorrect.

Score: 0

Accepted Answers:

No. of edges in all the graphs in H is same, the no. of edges in all the graphs in G may vary.

- 8) Given set  $E = \{1, 2, 3, \dots, 19, 20\}$ . We pick a value  $a_1$  uniformly at random from this set E. Next, we pick another value  $a_2$  , again uniformly at random from this set E. Similarly we pick 18 more values,  $a_3, a_4, \dots, a_{20}$  (a total of 20 numbers are picked). Look at the sum  $S = a_1 + a_2 + \dots + a_{20}$  . Which of the following sets define the range from which the sum S can have values from?

- $\{1, 2, \dots, 19, 20\}$
- $\{20, 11, \dots, 19, 200\}$
- $\{1, 2, \dots, 9, 400\}$
- $\{20, 11, \dots, 399, 400\}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$\{20, 11, \dots, 399, 400\}$

## Unit 12 - Week 10

### Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Week 10

- 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)
- Quiz : Assignment 10
- Week 10 Feedback

Week 11

Week 12

Assignment Solutions

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## Assignment 10

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-04-08, 23:59 IST.

- 1) Suppose the basic reproductive number is estimated to be  $\bar{R}_0 = 1.5$  with standard error s.e. ( $\bar{R}_0$ ) = 0.1. If a vaccine giving 100% immunity is available next time and a fraction  $v = 0.2$  of randomly selected individuals were vaccinated, an estimate of the new reproductive number would be 1 point

- 0.9
- 1.1
- 1.2
- 1.5

No, the answer is incorrect.

Score: 0

Accepted Answers:

1.2

- 2) In the modeling of mitochondrial eve using Wright-Fischer model, 1 point

- Population size can be anything in any generation.
- Population size doubles every generation.
- Population size remains the same in every generation.
- Population size halves every generation.

No, the answer is incorrect.

Score: 0

Accepted Answers:

Population size remains the same in every generation.

- 3) Suppose that a person carrying a new disease enters a population, and transmits it to each person he meets independently with a probability of 9/20. 1 point  
Further, suppose that he meets 1000 people from the population while he is contagious. What is the expected number of secondary infections produced?

- $1000^{0.45}$
- 450
- 1000
- 45

No, the answer is incorrect.

Score: 0

Accepted Answers:

450

- 4) Consider a disease 'X'. People who are diagnosed in the earlier stage have a high chance of recovery. But the intense infection of 'X' will lead to death. 1 point

The recovered people also stand a chance to get infected again. What kind of model does this disease 'X' exhibit?

- SIS
- SIR
- Both SIS and SIR
- Neither SIS nor SIR

No, the answer is incorrect.

Score: 0

Accepted Answers:

SIS

- 5) Choose the correct statement from the following. 1 point

- Both SIR and SIS models can run for an infinite number of steps on a network.
- Both SIR and SIS model should come to an end after running for a finite number of steps on a network.
- SIS model should come to an end after running for a finite number of steps on a network, while SIR model can keep running indefinitely on a network.
- SIR model should come to an end after running for a finite number of steps on a network, while SIS model can keep running indefinitely on a network.

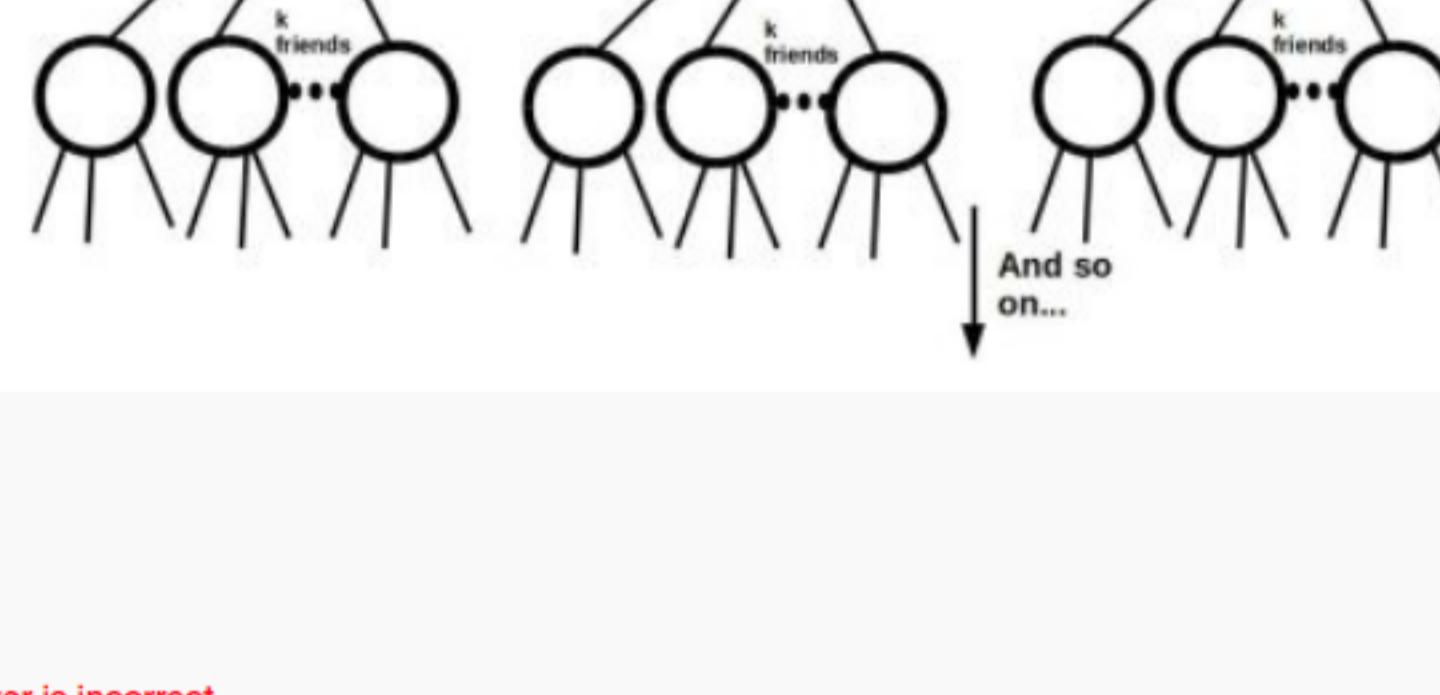
No, the answer is incorrect.

Score: 0

Accepted Answers:

SIR model should come to an end after running for a finite number of steps on a network, while SIS model can keep running indefinitely on a network.

- 6) In a tree network (as shown in the following Figure), given that the probability of infection across every edge is  $p$  and every node has  $k$  children, what will be the expected number of secondary infections produced from an infected person?: 1 point



- $p^2$
- $\log(k)$
- $p \times k$
- $p^k$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$p \times k$

- 7) For a contagion to ultimately die away from a population, the basic reproductive number ( $R_0$ ) should be: 1 point

- $R_0 > 1$
- $R_0 = 1$
- $R_0 < 1$
- None of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

$R_0 < 1$

## Unit 13 - Week 11

### Course outline

How does an NPTEL online course work?

**Week 0**

**Week 1**

**Week 2**

**Week 3**

**Week 4**

**Week 5**

**Week 6**

**Week 7**

**Week 8**

**Week 9**

**Week 10**

**Week 11**

Lecture 143 - Introduction

Lecture 144 : Milgram's Experiment

Lecture 145 : The Reason

Lecture 146: The Generative Model

Lecture 147 : Decentralized Search - I

Lecture 148 : Decentralized Search - II

Lecture 149 : Decentralized Search - III

Quiz : Assignment 11

Week 11 Feedback

**Week 12**

**Assignment Solutions**

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## Assignment 11

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

**Due on 2020-04-15, 23:59 IST.**

- 1) In the Milgram's small world experiment, what was the average number of hops in which the letters reached the target? 1 point

- 4
- 5
- 6
- 7

No, the answer is incorrect.

Score: 0

Accepted Answers:

6

- 2) In small world networks of size  $n$ , the average distance between any two random nodes is given by 1 point

- $O(n \log n)$
- $O(\log n^2)$
- $O(n)$
- $O(\log n)$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$O(\log n)$

- 3) Which of the following correctly represents a Watts-Strogatz model on ' $n$ ' nodes in 2 dimensional space? 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 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
- ' $n$ ' 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.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*'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.*

- 4) In decentralized search, 1 point

- Only the strong ties are required.
- Only the weak ties (long range contacts) are required.
- Both the strong as well as the weak ties are required.
- None of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Both the strong as well as the weak ties are required.*

- 5) Choose the correct statement 1 point

- Watts-Strogatz model resembles a ring in 1 dimension and a grid in 2 dimensions.
- Watts-Strogatz model resembles a grid in 1 dimension and a ring in 2 dimensions.
- Watts-Strogatz model resembles a ring both in 1 dimension as well as 2 dimensions.
- Watts-Strogatz model resembles a grid both in 1 dimension as well as 2 dimensions.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Watts-Strogatz model resembles a ring in 1 dimension and a grid in 2 dimensions.*

- 6) Random rewiring in small world generative model refers to 1 point

- Addition of an extra edge in the network
- Deletion of a random edge in the network
- Deletion of a random edge from the network and addition of a new edge in the network
- None of the above

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Deletion of a random edge from the network and addition of a new edge in the network*

- 7) Assume that each of your friends has 100 friends other than you. Similarly, each of their friends has 100 friends other than them and so on. Then, how many people can you reach in  $i$  levels (Level one refers to your friends, level 2 refers to your friends' friends and so on)? 1 point

- 100
- $100^{(i+1)}$
- $100^{(i-1)}$
- $100^i$

No, the answer is incorrect.

Score: 0

Accepted Answers:

*$100^i$*

## Unit 14 - Week 12

### Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Week 10

Week 11

Week 12

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

Quiz : Assignment 12

Week 12 Feedback

Assignment Solutions

Download Videos

## Assignment 12

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

Due on 2020-04-22, 23:59 IST.

- 1) Which of the following statements defines the  $k$ -shell of a graph?
- the subgraph induced by edges in the  $k$ -core and not in the  $(k+1)$ -core.
  - the subgraph induced by edges in the  $(k+1)$ -core and not in the  $k$ -core
  - the subgraph induced by edges in the  $k$ -core and not in the  $(k-1)$ -core.
  - the subgraph induced by edges in the  $(k-1)$ -core and not in the  $k$ -core

No, the answer is incorrect.

Score: 0

Accepted Answers:

*the subgraph induced by edges in the  $k$ -core and not in the  $(k+1)$ -core.*

- 2) An Internet meme is

- A piece of text traversing through the Internet.
- An image traversing through the Internet.
- A video traversing through the Internet.
- Any kind of digital artefact traversing through the Internet, be it an image, audio, video or a file in some other format.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Any kind of digital artefact traversing through the Internet, be it an image, audio, video or a file in some other format.*

- 3) Whether a meme will go viral or not depends on

- The quality of the meme and structure of the network
- Only on the quality of the meme
- Only on the structure of the network
- Neither on the quality of the meme nor on the structure of the network.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*The quality of the meme and structure of the network*

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

- High degree
- High betweenness
- High closeness
- High coreness

No, the answer is incorrect.

Score: 0

Accepted Answers:

*High coreness*

- 5) The  $i^{\text{th}}$  iteration of k-shell decomposition algorithm

- Removes all the nodes of degree  $i$  from the graph.
- Recursively keeps removing the nodes of degree  $i$  from the graph, i.e., keeps removing the degree  $i$  nodes from the graph till there are no degree  $i$  nodes in the graph.
- Recursively keeps removing the nodes of degree  $\leq i$  from the graph, i.e., keeps removing the node of degree  $\leq i$  from the graph till there are no degree  $\leq i$  nodes in the graph.
- Recursively keeps removing the nodes of degree  $\geq i$  from the graph, i.e., keeps removing the node of degree  $\geq i$  from the graph till there are no degree  $\geq i$  nodes in the graph.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Recursively keeps removing the nodes of degree  $\leq i$  from the graph, i.e., keeps removing the node of degree  $\leq i$  from the graph till there are no degree  $\leq i$  nodes in the graph.*

- 6) The nodes of degree 1 in a graph

- Will always belong to 1-core.
- Will always belong to 2-core.
- Can belong to any core.
- Will always belong to the innermost core of the network.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Will always belong to 1-core.*

- 7) Choose the correct statement from the following

- Both the core and periphery of a network are the nodes which are removed during the first iteration of k-shell decomposition algorithm.
- Core of a network are the nodes removed in the first iteration of the k-shell decomposition algorithm while periphery of a network are the nodes removed in the last iteration of the k-shell decomposition algorithm.
- Both the core and periphery of a network are the nodes which are removed during the last iteration of k-shell decomposition algorithm.
- Core of a network are the nodes removed in the last iteration of the k-shell decomposition algorithm while periphery of a network are the nodes removed in the first iteration of the k-shell decomposition algorithm.

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Core of a network are the nodes removed in the last iteration of the k-shell decomposition algorithm while periphery of a network are the nodes removed in the first iteration of the k-shell decomposition algorithm.*

- 8) In a clique of size 5

- Every node has a coreness of 4
- Every node has a coreness of 5
- Every node has a coreness of 6
- Every node has a coreness of 7

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Every node has a coreness of 4*

- 9) 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 called

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

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Pseudo-core*

- 10) Pick the incorrect statement for a complete graph:

- Neighborhood overlap is maximum for each pair of nodes
- Structural holes are present
- Edge betweenness of each edge is zero
- All nodes score same centrality score for any centrality measure

No, the answer is incorrect.

Score: 0

Accepted Answers:

*Structural holes are present*