Social Computing, Evaluation 1

CS60081, Autumn 2021

12:10 pm to 12:50 pm, 9th September 2021
Full marks: 30
Answer ALL questions

IMPORTANT INSTRUCTIONS

Taking the exam: You need to log into zoom, keep your video on during taking the test (so that we can monitor you during the exam). You will use pen and paper to write the exam,
Decorum: Throughout the examination, you are strictly expected to have their cameras on, directing towards their workspace including themselves. Arrange your laptops/desktops/mobiles beforehand to save time during the examination. Disconnecting video for a long duration will be grounds for suspecting malpractice.

You need to keep your workplace, your hands and your mobiles visible to us. We are trying to avoid the visibility of your answers in the papers to the rest of them. Once you open your question paper, refrain from using your PC/laptop from searching for anything or typing during the exam.

Tip: Install Adobe scan and, MS Teams on your phone to make the whole process easier. In that case, your laptop acts as a camera, while you are using your mobile for checking the questions, scanning and uploading the answers.

Submission: You can do either of two things (i) take pictures of your answer script pages, name the pictures page1.jpg, page2.jpg, page3.jpg etc., zip the pictures and upload the zipped file via CSE Moodle. (ii) Put all the pages sequentially in a pdf file and upload the pdf to KHARAGPUR Moodle. YOU HAVE TO USE PEN AND PAPER TO GIVE THE EXAM.

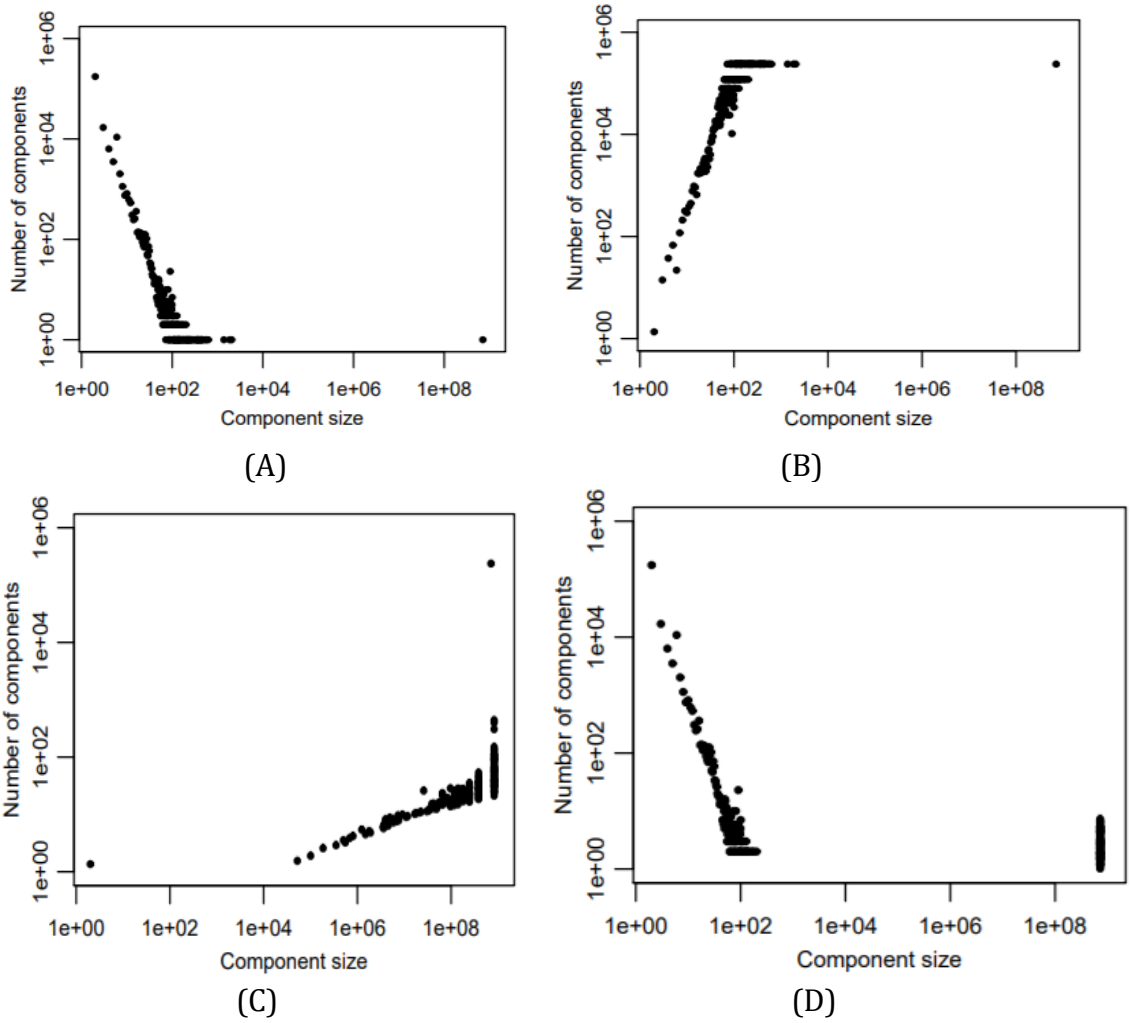
Policies: Note that, if we face problems with your answer script e.g., cannot open your submitted zipped file, cannot read the text in pictures (due to bad resolution), cannot determine the page order from the file names (or the pages in the pdf is jumbled up), or we find you copying, it will affect your marks.

Malpractice: If any group of students is found to have similar work in their answer sheets, all of them will receive the maximum penalty with no grace. We expect you to not take help from the internet, your copies, textbooks, slides or video recordings during the exam. Note that this is not an open-book exam. If found otherwise, you will be penalized.

PLEASE WRITE YOUR NAME AND ROLL NO. ON THE TOP OF THE FIRST PAGE OF YOUR ANSWER SCRIPT. WE WILL NOT EVALUATE YOUR ANSWER SCRIPT WITHOUT IT.

Question 1. In the Facebook network graph, it is known that most of the nodes (99.9%) are present in a single connected component. Which of the below plots, most likely to represent the above characteristics? Explain your choice in at most 3 sentences

[0.5 + 2.5 = 3]



(A) (B)

(C) (D)

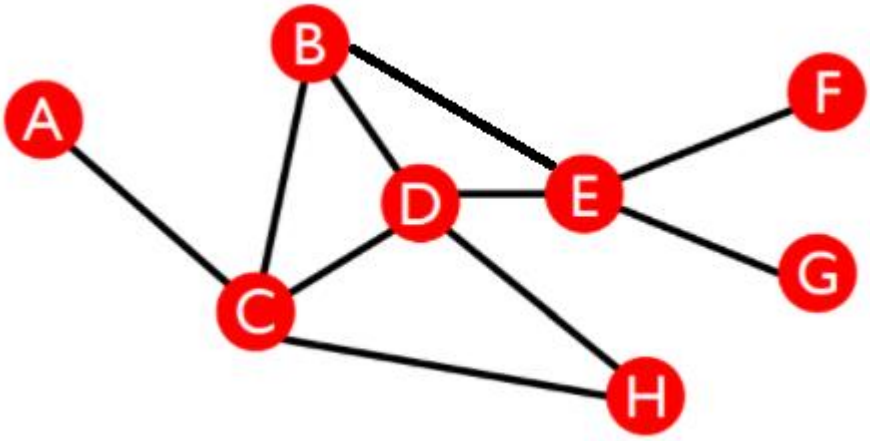
Question 2. A social networking site exhibits very low reciprocity among its users (i.e., users you follow do not follow you back). Which of the options is correct about the structure of the site? Choose all that apply. Explain your choice in at most 3 sentences

[0.5 + 2.5 = 3]

A. The degree of separation among the users will be very high.
B. The degree of separation among the users will be low.
C. We cannot comment on degree of separation from the provided data.

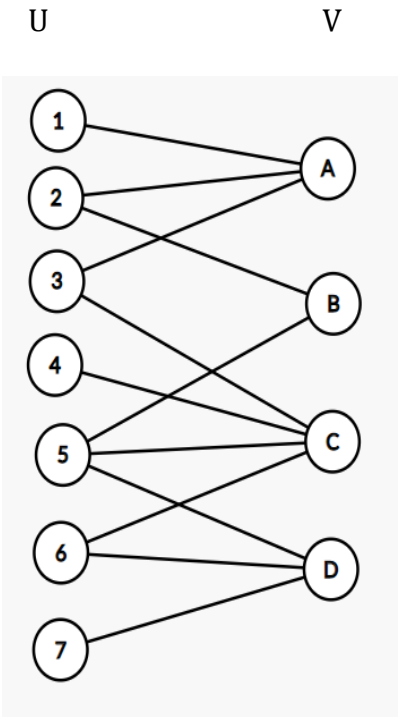
Question 3. Calculate the clustering coefficients of Node C and Node D in the following graph**.** Show your calculation (putting only the value will not get any marks).

[3 + 3 = 6]



Question 4. Draw the unweighted projection network of set of nodes U and V in the given bipartite graph?

[3 + 3 = 6]



Question 5. Please choose all the options that apply for each of the questions below (no reasoning needed): **[2 + 2 = 4]**

5.1. Which one of the following statements is/are true for a random graph?

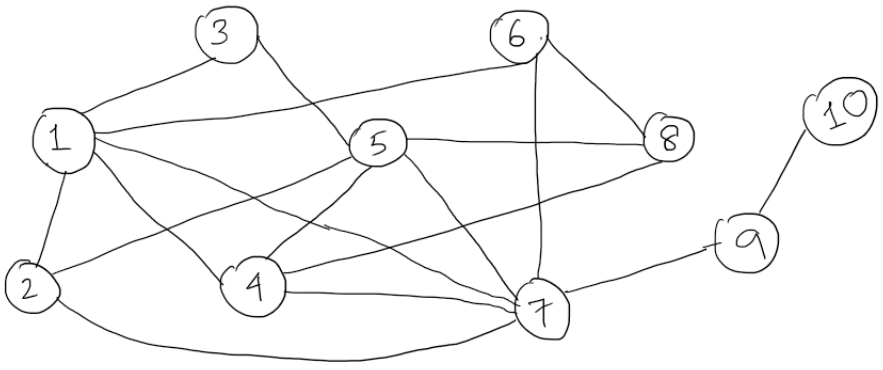
a. Clustering coefficient is close to zero.
b. Does not follow power law distribution.
c. Distance between two nodes are always high.
d. Does follow exponential degree distribution.

5.2. Which one of the following statements is/are true for small world network?

e. Clustering coefficient is low.
f. Distance between the nodes are lesser.
g. Railway network is an example of small world network.
h. Co-authorship network is not a correct example for small world network.

Question 6. There is a remote village with bad internet connectivity. You are the task-in-charge who has to share the information about COVID 19 vaccination among the villagers. However, to reduce the labor, you want to share the information with such a person (only one person) who can share the information with the maximum number of villagers. One person can propagate the message to its immediate neighbor(s) only.

Here is a given network of the villagers (nodes). There is an edge between two nodes if they know each other. Which node should you pick such that you maximize the number of nodes getting the desired message? Why (no marks without explanation)? **[5]**



Question 7. What is the degree assortativity of a complete graph of n-nodes, i.e., each pair of nodes are connect by an edge (remember: in case of degree assortativity the attribute of a node is their degree). Show your calculation/reasoning.

[3]