

Indian Institute of Technology Kharagpur
Social Computing (CS60017)
Autumn Semester Mid-Semester Examination 2017-18

Full Marks: 40

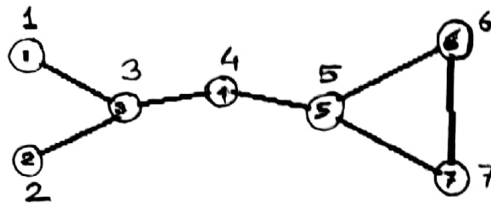
Time: 2 hours

*All parts of the same question must be answered together
Be precise in your answers, and state any assumptions made*

$\alpha = 0.85$

Question 1 [6 marks]

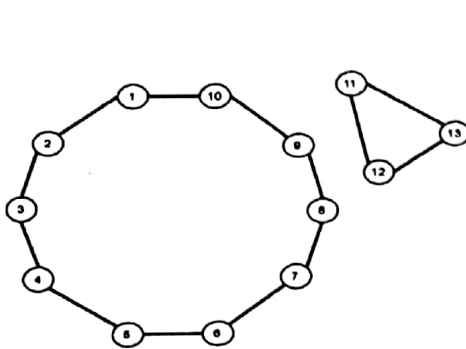
For every node in **Network 1**, calculate (i) Betweenness Centrality, and (ii) Closeness centrality.



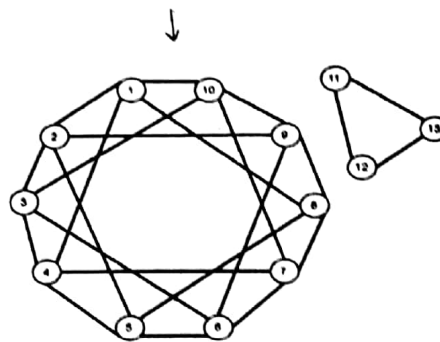
Network 1

Question 2 [6 marks]

Compute Network Clustering Coefficient for both **Network 2** and **Network 3** in the figures below. Does any of the two networks exhibit small-world properties?



Network 2



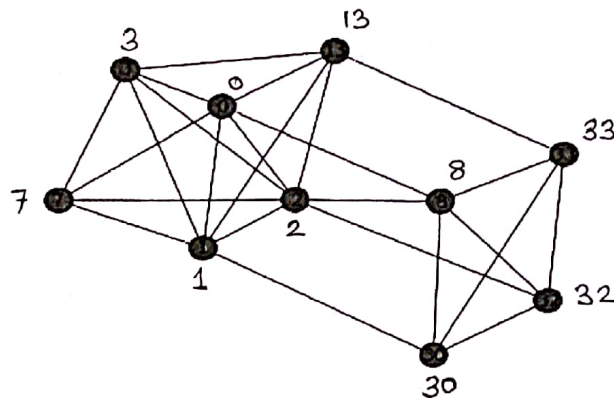
Network 3

Question 3 [6 marks]

Compare and contrast regular networks, Erdos-Renyi networks, and social networks w.r.t. their (i) degree distribution, and (ii) average clustering coefficient.

Question 4 [6 marks]

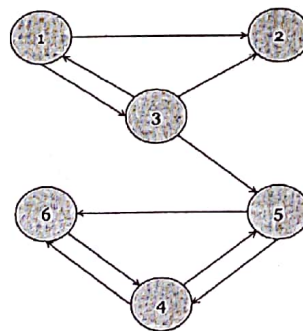
In **Network 4** shown below, (a) Compute the **conductance** of the subgraph formed by the nodes {8, 30, 32, 33}. (b) Find two **adjacent k -cliques**, for $k = 3$ and $k = 4$, considering the definition of k -cliques in the Clique Percolation Method.



Network 4

Question 5 [8 marks]

Rank the nodes in **Network 5** (shown below) in decreasing order of their PageRank values. Show the steps in PageRank computation up to **two iterations**.



$$\alpha = 0.85$$

Network 5

Question 6 [8 marks]

Consider a video watching site (such as Youtube) where users watch and rate videos. Such sites usually deploy recommendation systems to help users find videos of their interest.

- (a) Given a **particular video v** , devise an algorithm that will identify some videos which are 'similar to' v , i.e., likely to be of interest to a user who has liked v .
- (b) A **certain user u** has already viewed and liked videos v_1, v_2, \dots, v_k . Devise an algorithm that will recommend to u some more videos that are likely to be of interest to her.
- State any assumptions you make while devising the algorithms.