Social Computing

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Q1. (a) Complete 1-degree egocentric network.

Here we ~~with~~ can see the people directly connected to the individual user.
So, we can see the friendlist & the corresponding interests for the analysis of the user.

(b) 1.5 degree egocentric.

Using this, we can infer about the mutual connection. It will form a triad.

Q2. Here ~~the~~ ~~expected~~ for less susceptibility ~~of~~ to misinformation propagation, lesser engagement for unreliable posts & more expected engagement for reliable posts.

So, basically for this,
The susceptibility to misinformation is directly proportional to the metric k_i.

So, the most susceptible media platforms will be Z because it is having maximum value of k_i.

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Q3. (a) We know clustering coeff. of complete graph = $\frac{3 \times {}^{n}C_3}{n}$

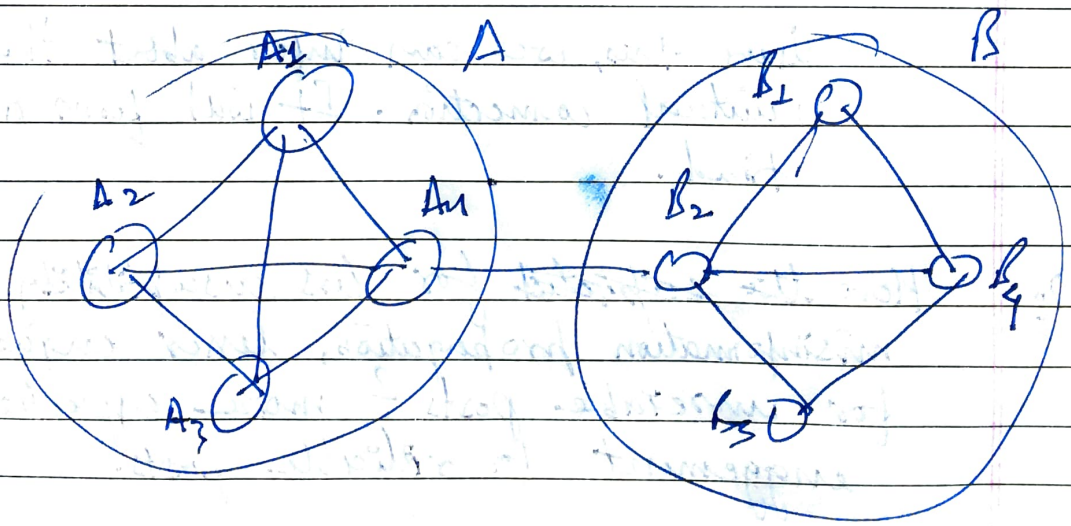
$$\Rightarrow \frac{3n(n-1)(n-2)}{n \times 3 \times 2}$$

$$\Rightarrow \frac{n^2-3n+2}{2}.$$

$$a+2b+3c = \frac{1+2\times(-3)+3\times 2}{2} = \frac{1}{2}.$$

Q4. Modularity is given by

$$Q = \frac{1}{2m} \sum_{ij} \left(A_{ij} - \frac{k_i k_j}{2m} \right) \delta(C_i, C_j)$$



Here,
for every pair $A_k B_j$ for $k = 1, 2, 3, 4$
$j = 1, 2, 3, 4$.

Contribution will be zero as
$S(A_k B_j) = 0$ because they are in different community.

$m = 12$

$$Q_{A_1 A_2} = 1 - \frac{3 \times 3}{2 \times 12} = 1 - \frac{9}{8} = \frac{5}{8}.$$

$$Q_{A_1 A_3} = \frac{5}{8}.$$

$$Q_{A_1 A_4} = \frac{5}{8} \cdot 1 - \frac{3 \times 4}{2 \times 12} = \frac{1}{2}.$$

$$Q_{A_2 A_3} = \frac{5}{8} \cdot \frac{5}{8} \cdot \frac{1}{2}, \quad Q_{A_2 A_4} = \frac{5}{8} \cdot \frac{1}{2}.$$

$$Q_{A_3 A_4} = \frac{5}{8} \cdot \frac{1}{2}.$$

$$Q_{B_1 B_3} = 1 - \frac{2 \times 2}{2 \times 12} = \frac{-1}{6}.$$

$$Q_{B_1 B_2} = 1 - \frac{2 \times 4}{2 \times 12} = \frac{2}{3}.$$

$$Q_{B_1 B_4} = 1 - \frac{2 \times 3}{2 \times 12} = \frac{5}{4}.$$

$$Q_{B_2 B_3} = 1 - \frac{3 \times 2}{2 \times 12} = \frac{3}{4}.$$

$$Q_{B_2 B_4} = 1 - \frac{3 \times 4}{2 \times 12} = \frac{1}{2}.$$

$$Q_{B_3 B_4} = 1 - \frac{3 \times 2}{2 \times 12} = \frac{3}{4}.$$

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Then,

$$Q = \frac{1}{2m} \Sigma \text{ sum of all above Q.s.}$$

$$= \frac{1}{2\times 12}\left[3\times\frac{\Sigma}{8} + 3\times\frac{1}{2}\right]$$

$$+ \frac{1}{2\times 12}\left[-\frac{1}{6} + \frac{2}{3}\times 2 + \frac{3}{4}\times 2\right]$$

$$= 0.2795.$$