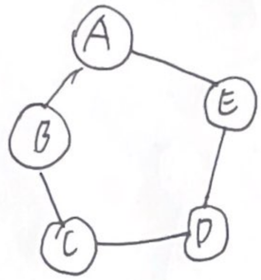
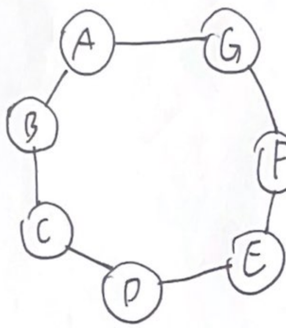
STA 352 Zishan (Bruce) Shao HW1

Q1:

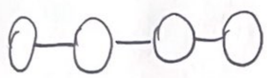
(a)



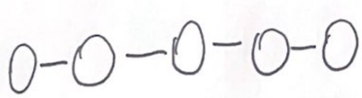
(b)



~~(c)~~ Q2:



Q3:



Q4: b, c needs to be connected by weak edges so it satisfies "Strong triadic closure" property. STC → satisfied if every pair of its strong neighbors are connected

Q5: STC satisfied Nodes: B (with A, C), D (with A, E), A → with B, D

Not satisfied: C, E

Q6: C and E, where for C, (B, E) are not connected, for E, (C, D) are not connected

Q7: STC satisfied Nodes: A (with B, C), B → with A, C, D, E

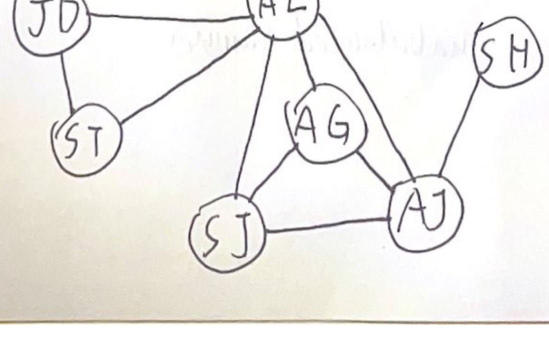
Not satisfied: C, ~~E, D~~

only case-possible nodes?

If less than 2 edges strong, or not enough pairs → default satisfies

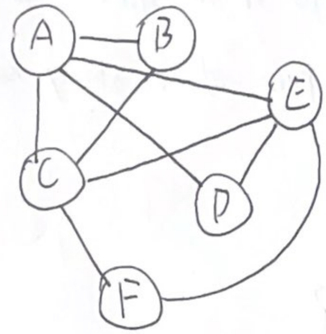
Q8: It would be b and d, which they have the ~~most~~ highest number of common neighbors, so ~~highest~~ it is likely that they will soon be connected with an edge that is highly embedded

Q9: John Doerr → JD, I will use such acronyms



Q10:

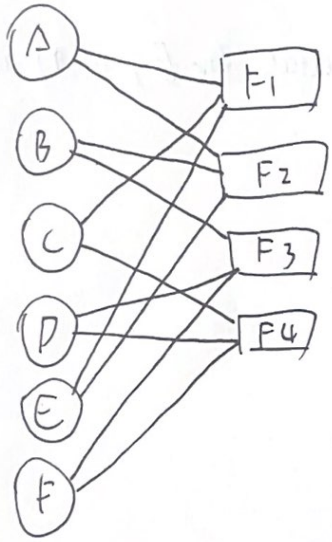
(a)



(b) A, C, E is very interesting because The ~~not~~ triangle was formed by the connection of each pairs from three different focis, while for other triangles such as A, D, E, they ~~th~~ share the same foci Y.

Q11:

(a)



(b) As there are 4 interconnected components in graph (in this case, 4 triangles), so we need at least 4 foci

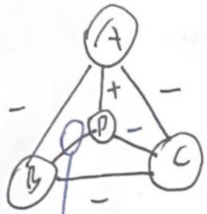
This is because (A, B), (C, D), should in a group but (A, C), and (B, D) can't be in same group of (A, B), (C, D), so we need at least 4 groups, so 4 focis at least

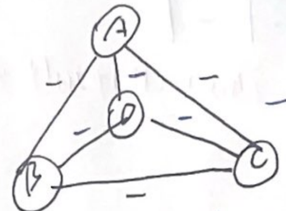
Q12: (people from 3 villeges)

It is not balanced, as they are enemy of any other from other villeges, which will result in "−, −, −" (odd number of negative edges) situation, and thus make it not balanced

Q13: For each positive edges, they have one corresponding balaned triangles, and two unbalanced triangles. For each negative edges, they have two balanced triangles & one unbalanced triangles.

Q14: (a) There is no way that a D node result in a balanced network with 3 nodes hostile to each other. This is because you can never take care of all members without breaking their previous relationship

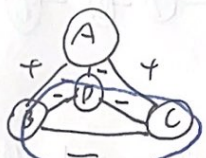


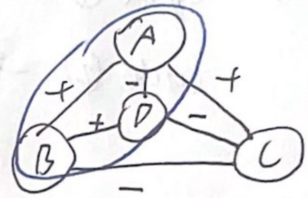


→ all negative/positive of D will result in "-,-,-" or "-,+,+" imbalances

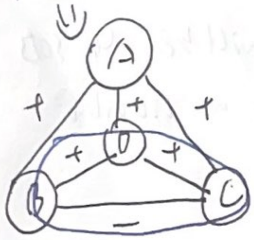
needs to be "+" for BDC be balanced, but will result unstable ABD, so impossible to be balanced

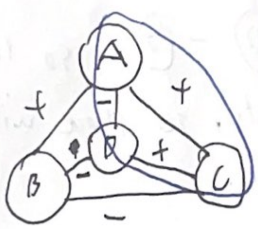
(b) ~~Yes~~ No, there are ~~one~~ no way to make it stable





not stable

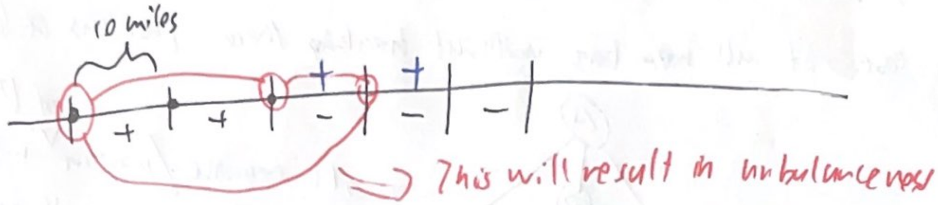




~~D's edges need to be all positive, if negative edges, result in "+,+,-" "+,-,-" imbalances~~

(C) ~~If~~ Impossible, because if the node X is added to a network ~~to~~ contains an unbalanced triangle, it will always result in a new unbalanced triangle as we observe from (a) and (b), so impossible

Q15: It is not balanced because as following

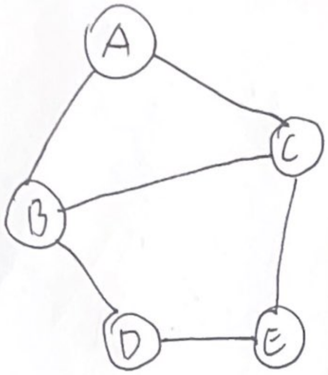


Q16: (a) cycle ① → ⑫ - ⑧ - ⑰ - ① - ⑪ - ⑥ - ⑫

cycle ② → ⑫ - ⑦ - ② - ⑥ - ⑪ - ① - ⑰ - ⑧ - ⑫

(b) I will swip ⑫ - ⑥ and ⑫ - ⑦, so there will be 4 sets with all edges positive inside sets, so there will be no number in a set adversial to each other.

Q17: (a)



~~Edge~~ Edge: A↔B — 1 + 1 = 2

A↔C — 1 + 1 = 2

A↔D ~~×~~ ABD

A↔E — ACE

B↔C — $1 + \frac{1}{2} + \frac{1}{2} = 2$

B↔D — $1 + 1 + \frac{1}{2} + \frac{1}{2} = 3$

B↔E — BDE / BCE

C↔E — $1 + \frac{1}{2} + 1 + \frac{1}{2} = 3$

D↔E — $\cancel{0}\ \frac{1}{2} + 1 + \frac{1}{2} = 2$

C↔D — ~~BCE~~ CBD, CED

directly ~~connected~~ connected edge ←

vertex: A = 0

B → $1 + \frac{1}{2} = 1.5$

C → $1 + \frac{1}{2} = 1.5$

D → $\frac{1}{2} = 0.5$

E → $\frac{1}{2} = 0.5$

verified with R

(b)

A → $\frac{1}{1} = 1$

B → 3 neighbors → 3 potential links, → $\frac{1}{3}$ (2+1 ⇑)
only 1 connected

C → 3 neighbors, 3 potential links, 1 connected → $\frac{1}{3}$

D → $\frac{0}{1} = 0$

E → $\frac{0}{1} = 0$

verified with R

(c) total 5 nodes, potentially

~~4+3+2+1 = 10~~

1+3+3+1+1 = 9 potential ~~edges~~ link

currently 3 ~~6~~ links ~~edges~~

so global coefficient = $\frac{3}{9} = \frac{1}{3}$

verified in R