

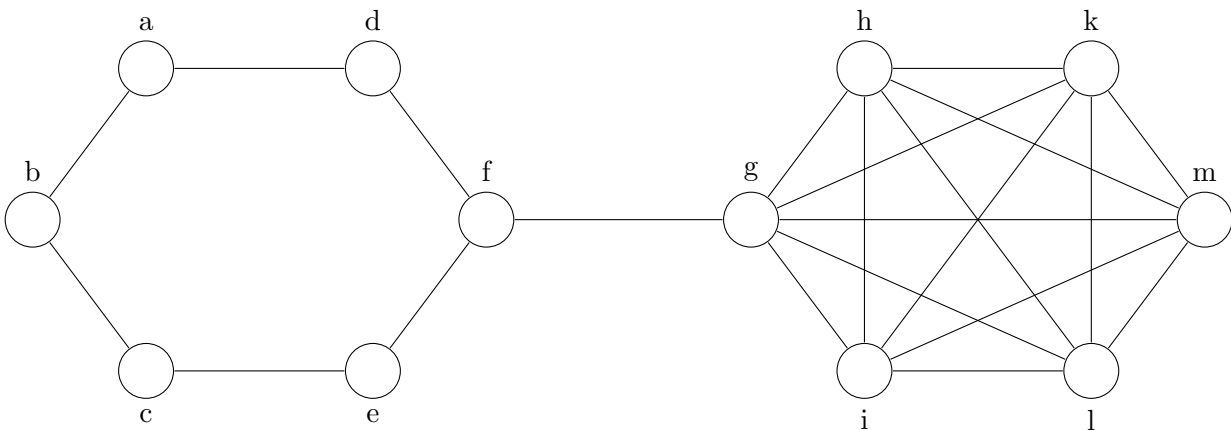
July 2022

EXAM

[due date: 29 August 2022]

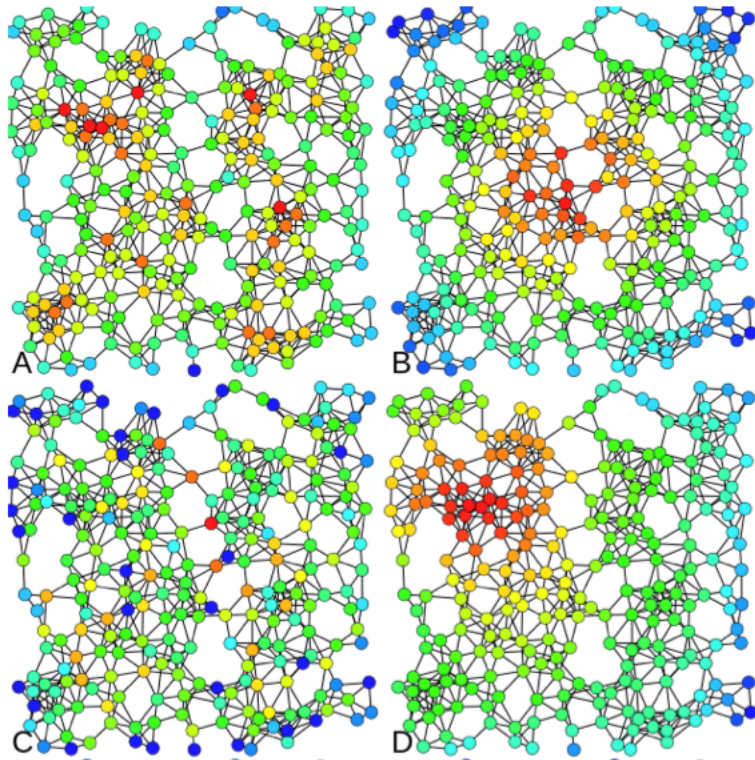
Please present your answers in a clear, well documented, and legible form. Please submit the final document as a pdf file, not a Word document. If you have any questions about the exam, do not hesitate to contact me at pamato@essex.ac.uk

QUESTION 1



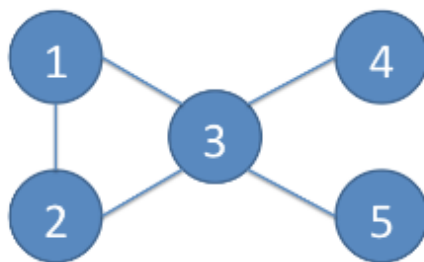
- 1.1 Write down the adjacency matrix for this network;
- 1.2 Write down the nodelist representation of this network;
- 1.3 Which node(s) have the highest degree centrality?
- 1.4 Which node(s) have the highest betweenness centrality?
- 1.5 What centrality measure would you choose to characterise this network? Why?
- 1.6 How many components does this network have? What is the diameter of this network?
- 1.7 Which measure would you choose to represent the level of cohesion of this network: F-measure of fragmentation or Distance-weighted fragmentation? Explain why.

QUESTION 2



2.1 Which centrality measures would you associate with the coloration of vertices in each of the networks above (A, B, C and D)? (Note: the colouring scale applied varies from blue (least important/lowest score on centrality measure) to red (most important/highest score on centrality measure))

QUESTION 3



3.1 Use your favourite community structure algorithm to find 2 communities in the network above. Describe your approach.

QUESTION 4

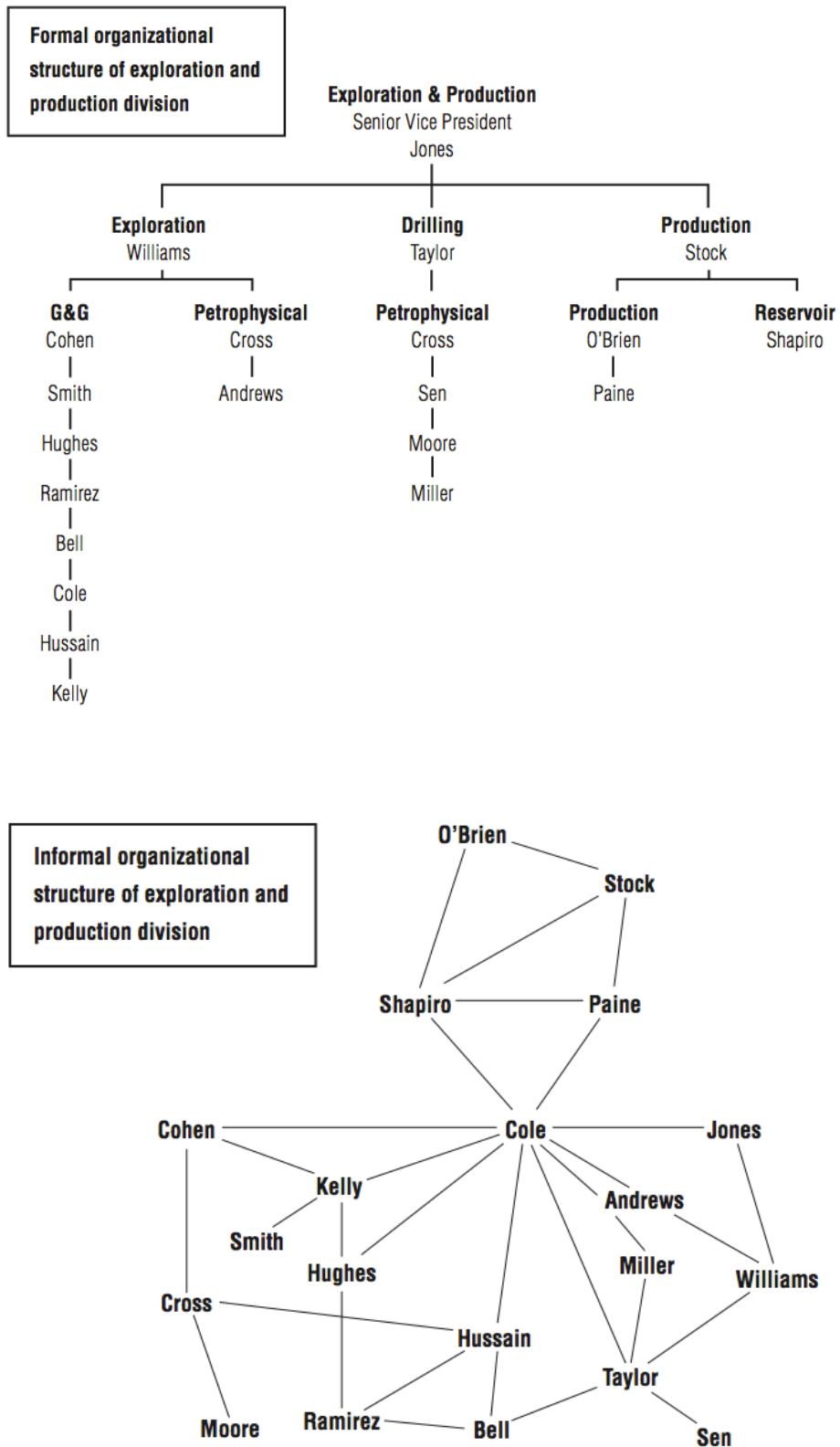


Figure 1: Formal vs. informal structure in a petroleum organization.⁴

The figures above represent the organisational chart and an informal organisation network of the top 20 Executives within the exploration and production division of a Petroleum organisation.

4.1. Identify three features of the informal network (second figure) and explain how can they be problematic for the overall functioning of this petroleum company.

4.2 According to Gould & Fernandez concepts of brokerage roles, what role does Cole take on for the majority of his interactions?

4.3. Based on Burt's idea of structural holes, who is the most important person in the informal network? Is this person also the most important Executive according to the formal organisational chart (first figure)?