Student Answer Sheet Analysis

Automated Processing System

July 5, 2025

Questions and Student Responses

Question 1

Question: Consider the following incidence matrix of a simple undirected graph. Convert this into an adjacency matrix representation. [2 marks]

Student Answer:

Given Incidence Matrix

$$\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Consider rows as nodes - 4 nodes
Consider columns as edges - 3 edges
Find adjacency matrix by following below mapping
Edge 1 connects node A & B
Edge 2 connects node B & C
Edge 3 connects node B & D

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$$

Question 2

Question: Which network model assumes that edges are formed between pairs of nodes with a uniform probability, independent of other edges? [2 marks]

Student Answer:

Ans: B. Erdős–Rényi (Random network Model)
It creates edges between pairs of nodes independently with equal probability.

Question 3

Question: In game theory, a situation where no player can improve their outcome by unilaterally changing their strategy, given the strategies of other players, is known as: [2 marks]

Student Answer:

Ans: C. Nash Equilibrium
It states where no player can benefit by unilaterally changing their strategy, assuming all other players are holding their strategies constant.

Question 4

Question: The tendency for individuals in a social network to associate and bond with similar others is defined as: [2 marks]

Student Answer:

Ans: B. Assortative Mixing
The tendency of nodes in a network to connect with other nodes that have similar characteristics.

Question 5

Question: Why might betweenness centrality be a more relevant measure than degree centrality for identifying critical nodes in a network transmitting information that must follow specific paths? [2 marks]

Student Answer:

Ans: D. Because it quantifies how often a node lies on the shortest paths between other nodes.

Additional Responses

Student drew: Various diagrams and calculations related to network models, game theory, and centrality measures.