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| **GE 2318 Homework #1 2024**  **Name: Student ID:**  **Q 1:** Consider the following network:    Calculate:    So,  Path Lengths   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Node | **0** | **1** | **2** | **3** | **4** | **5** | | **0** |  | 2 | 1 | 1 | 1 | 1 | | **1** |  |  | 1 | 2 | 2 | 1 | | **2** |  |  |  | 1 | 2 | 2 | | **3** |  |  |  |  | 1 | 2 | | **4** |  |  |  |  |  | 1 | | **5** |  |  |  |  |  |  |     **Q 2:** Consider the generation of a scale-free network, starting initially from the above network shown in Q1. Now, suppose that a new node comes in.  (1) What is the probability that the new node will connect to Node 0?    (2) Assuming that the above new node is indeed connected to Node 0 but not any other node. Now, another new node comes in. What is the probability that the second new node will connect to Node 5?    **Q 3:** Compare “Small-World Networks” and “Scale-Free Networks”   |  |  | | --- | --- | | **Similarities** | **Differences** | | **1.** Both are connected networks (random-graph networks may not be all connected)  **2.** Both are not regular, not symmetrical, not dense  **3.** The connectivity of both networks depends on probability, hence has randomness  **4.** The degree distributions of both networks are independent of the network sizes for very large networks | |  |  |  | | --- | --- | --- | |  | **Small-World Networks** | **Scale-Free Networks** | | **1.** | Connectivity: Approximately Poisson distribution | Connectivity: Power-law distribution | | **2.** | Homogeneity | Non-homogeneity | | **3.** | Average path length is short | Average path length is not short in general | | **4.** | Not growing | Growing | | |