



# UNIVERSITY OF RUHUNA

## Faculty of Engineering

End-Semester 8 Examination in Engineering: February 2020

Module Number: EE8211

Module Name: Design and Management of Data Networks

[Three Hours]

[Answer all questions, each question carries 10 marks]

- Q1 a) State four benefits of a hierarchical network design. [2.5 Marks]
- b) A Communications Manager is added to a network as part of a Voice over IP (VoIP) solution. Which submodule of the enterprise architecture model should be arranged for the Communications Manager? Explain why? [2.5 Marks]
- c) The network shown in Figure Q1 c) was designed by an individual who is not aware of hierarchical network modelling. How do you modify this network, while keeping the services needed by the end nodes unchanged and a hierarchical model is in place?

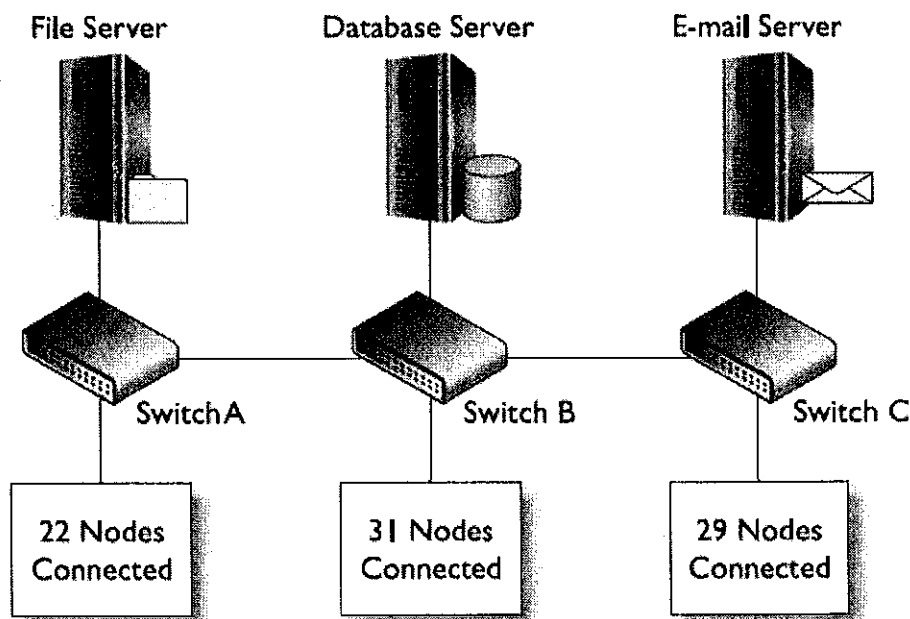


Figure Q1 c)

- d) A campus network of four buildings has some issues with its performance. Each building contains 400 to 600 devices, and uses only one Internet Protocol (IP) subnet. The buildings are connected as a star configuration centered around Building 1 with Gigabit Ethernet multimode fiber links. All servers are located in Building 1. What is your recommendation to improve the performance of the network? [2.5 Marks]

- Q2 a) Explain the three main steps in Prepare, Plan, Design, Implement, Operate and Optimize (PPDIOO) design methodology. [2.0 Marks]
- b) From topics; improving customer support, establishing the budget, increasing competitiveness, completion in three months, reducing operational costs, and network personnel are busy, which topics are considered as  
 i) organizational constraints?  
 ii) organizational goals? [2.5 Marks]
- c) Form the sections; IP addressing scheme, implementation plan, list of layer 2 devices, design requirements, selected routing protocols, and list of layer 1 devices, select four sections that should be included in a design document. [2.5 Marks]
- d) Secure transactions are emphasized as the initial requirements for a network design of a credit card company. Redundant links are also required to reduce network outages. What is the order of the four design activities of the network; IP addressing design, physical topology design, security design, and network modular design for the top-down approach? [3.0 Marks]
- Q3 a) Which edge Internet submodule is connected to the enterprise edge Internet submodule? [2.0 Marks]
- b) Select three from the server types; web, application, database, intranet, internet, and public share, that are placed in a e-commerce submodule. [2.0 Marks]
- c) Answer the following questions using Figure Q3 c).

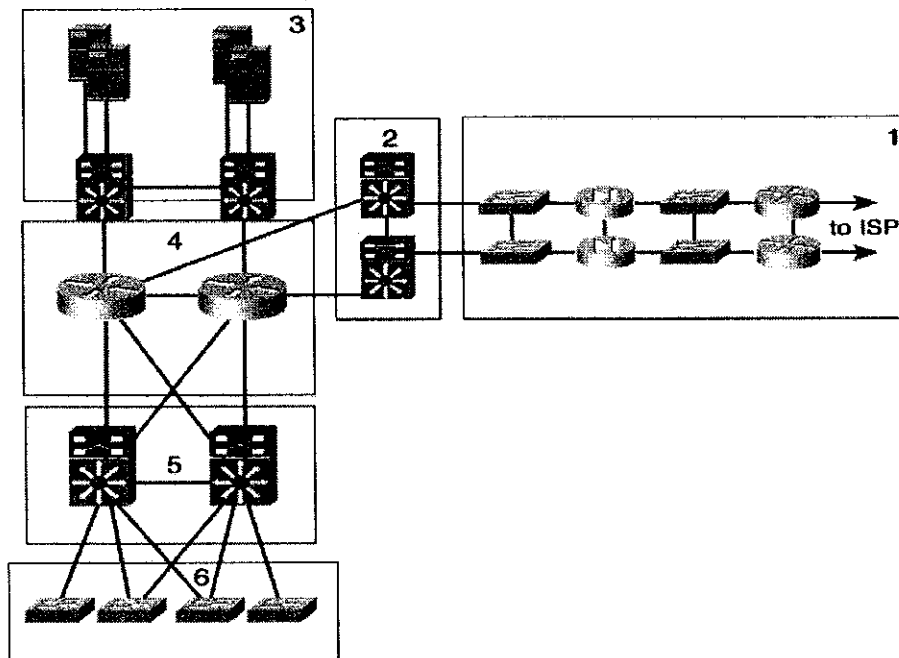


Figure Q3 c)

- i) What is the block used to represent the enterprise edge?  
 ii) What is the block used to represent the campus distribution layer?  
 iii) What is the block used to represent the campus access layer?

[3.0 Marks]

- d) From the topologies; full mesh, partial mesh, hub and spoke, extended star, dual ring, and Ethernet channel, What is the best topology to be used for making connectivity in
- building distribution layer?
  - access layer?
  - core layer?

[3.0 Marks]

Q4 a) Briefly explain the following terms that relates the routing process of a network.

- Split horizon
- Hold-down timer

[1.0 Mark]

- b) Perform Dijkstra's algorithm to find the shortest path from node C to all other nodes in the network shown in Figure Q4 b). Give a table that shows the results of each step and sketch the shortest paths.

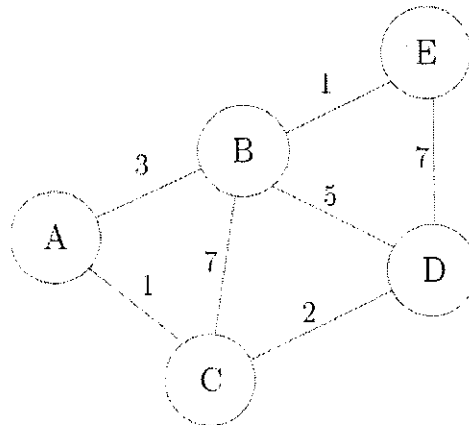


Figure Q4 b)

[3.0 Marks]

- c) Name one advantage of Dijkstra's algorithm over Bellman-Ford's algorithm and one advantage of Bellman-Ford's algorithm over Dijkstra's algorithm.

[1.0 Mark]

- d) The Company VWX has the network shown in Figure Q4 d). The main site has three LANs with 100, 29, and 60 hosts. The remote site has two LANs, each with 100 hosts. The network uses private addresses. The Internet service provider assigns 210.200.200.8/26 for the VWX company network.

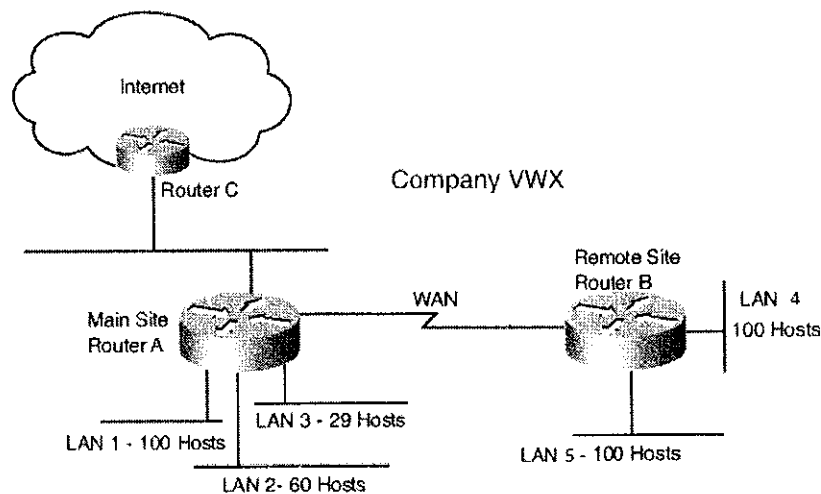


Figure Q4 d)

- i) The main site and the remote site use network prefixes 192.168.15.0/24 and 192.168.10.0/24 respectively. Design subnets and subnet masks to provide sufficient addresses for LAN 1, LAN 2, LAN 3, LAN 4, and LAN 5 in main and remote sites.
- ii) What is the best subnet and its subnet mask to be selected for the WAN link from a network prefix of 192.168.11.0/24?
- iii) Write the summary route advertised by Router A to Router C for LAN 1, LAN2, LAN 3, LAN 4, LAN 5, and the WAN link.
- iv) Which networks does Router C announce for the Internet router of the Internet service provider?

[5.0 Marks]

- Q5 a) Briefly explain five components of the network management architecture. [2.0 Marks]
- b) What is the main difference between the Simple Network Management Protocols (SNMP) version 2 and version 3? [1.0 Marks]
- c) Suppose that you are asked to use a new type of router for the network. What should you do to ensure that the SNMP traps received from the router are correctly interpreted by the Network Management System (NMS)? [2.0 Marks]
- d) Which routing protocol do you use for the core of a large enterprise network that supports VLSMs for a network with a mix of Cisco and non-Cisco routers? [2.5 Marks]
- e) A retail chain has about 800 stores that connect the headquarters and a backup location. The company wants to reduce the routing traffic in WAN links. Identify two routing protocols that satisfies the above requirements. [2.5 Marks]