BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE

BSc HONS DEGREE IN COMPUTER SCIENCE/INFORMATION TECHNOLOGY /NETWORK ENGINEERING/SOFTWARE ENGINEERING

CS212/CSH201/NWE204/SWE215 - DATA COMMUNICATIONS AND NETWORKING

2 HOURS 30 MINUTES

INSTRUCTION TO CANDIDATES

OCT 2024

Answer **all** questions.
Each question carries **20** marks. Total marks are **100.**

Question 1

a. Explain any **two** characteristics of effective communication in data networks. **[4]**

b. Various types of network hardware may be used to connect parts of a large network. Give a summary of the characteristics of the following:

   i. Router **[3]**

   ii. Multilayer switch **[3]**

c. Calculate the maximum bit rate of a noiseless channel with a bandwidth of 8500 Hz transmitting a signal with two signal levels. **[4]**

d. An organisation would like its mobile workers to access services on its intranet from various sites they might be working from. Describe any **three** connection technologies they can implement for such a setup. **[6]**

Question 2

a. A company with three departments has been allocated a network address 192.168.1.0/24 by its ISP. They intend to create a subnet for each department.

   i. How many bits of the host part should be used to create the three subnets? **[1]**

   ii. Create the subnets specifying the network address, host range and broadcast address for each subnet. **[9]**

b. Ethernet supports a protocol known as Carrier Sense Multiple Access with Collision Detection (CSMA/CD). Explain how CSMA/CD works, giving an example of how it ensures a low probability of collision when two nodes attempting to transmit at the same time. **[10]**

Question 3

a. Suppose you want to implement a mechanism that automates the IP configuration, including IP address, subnet mask, default gateway, and DNS information. Describe the protocol you would use to accomplish that. **[4]**

b. Describe the primary differences between the link-state and distance vector routing algorithms. **[4]**

c. Explain the following error detection schemes:

i. Cyclic redundancy check. **[2]**

ii. Parity. **[2]**

iii. Block checksum. **[3]**

d. Describe the leaky bucket congestion control algorithm. **[3]**

a. In the development of Wi-Fi network protocols security, upgrades were made from WEP to WPA1 and then WPA2. Describe the improvements that were done in these upgrades. **[6]**

Question 4

a. Token-passing networks move a small frame, called a token, around the network. Possession of the token grants the right to transmit.

i. Explain the token ring operation. **[6]**

ii. State **two** key advantage of token passing protocol over CSMA/CD protocol. **[4]**

b. Describe Asynchronous Transfer Mode (ATM). **[4]**

c. What are advantages of ATM Network? **[6]**

Question 5

a. What is the difference between Distance Vector Routing Protocols and Link State Routing Protocols? **[6]**

b. In the development of Wi-Fi network protocols security, upgrades were made from WEP to WPA1 and then WPA2. Describe the improvements that were done in these upgrades. **[6]**

c. Common solutions that can protect computer communication networks from attacks are classified as cryptographic techniques or authentication techniques (verification).

   i. What services are offered by each technique? **[4]**

   ii. What are the drawbacks of public key encryption over secret key encryption? **[4]**

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