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

NOV 2024

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

Question 1

a. State any **two** advantages and any **two** disadvantages of ring topology. **[4]**

b. Explain broadcast network, point to point network and multipoint networks. **[6]**

c. Explain the concept of layered task of networking. **[4]**

d. The physical layer coordinates the functions required to carry a bit stream over a physical medium. Describe the following functions:

   i. Synchronization of bits **[3]**

   ii. Line configuration **[3]**

Question 2

a. State any **three** differences between UTP and STP cable. **[3]**

b. The conversion of the user data into a transmission signal is called Encoding. There are several line coding schemes. Given the bit pattern **0010 1110**, list the features of each of the following scheme, and sketch the resulting waveforms.

   i. NRZ-I Encoding **[4]**

   ii. Differential Manchester Encoding **[4]**

c. Transmission impairment means that the signal at the beginning of the medium is not the same as the signal at the end of the medium. Describe the **three** causes of signal degradation. **[9]**

Question 3

a. Consider the local network shown in Figure Q3 which consists of a router, R1 and three subnets A, B and C. Suppose you are to allocate 20 nodes in subnet A, 100 nodes in subnet B, and 350 nodes in subnet C.

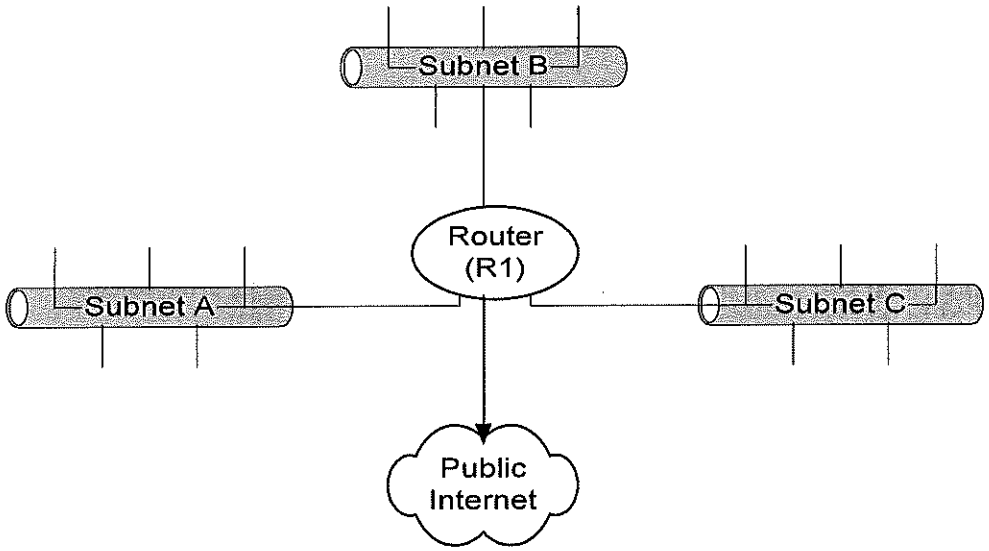

Figure Q3 A local network with 3 subnets

i. Specify the class of IP address that can be used by the network and why. **[2]**

ii. List any **three** benefits of subnetting. **[3]**

iii. Assuming you are going to use the IP address in the block of **161.139.*x.x***, create those three subnets by giving appropriate range of IP addresses to each one of them. **[7]**

iv. Can class C IP address be used in the network? Explain why? **[2]**

b. The network layer provides either connection-oriented service or connectionless oriented service to the transport layer. Differentiate between connection oriented and connectionless oriented service with examples. **[6]**

Question 4

a. In a switched communication network, data entering the network from a station are routed to the destination by being switched from one switch to another switch. Two switching technologies normally used are circuit switching and packet switching.

i. Describe **two** disadvantages of circuit switching compared to packet switching. **[4]**

ii. List **three** causes of packet delay that normally occur in packet-switched network. **[3]**

b. Describe any **three** reasons for breaking a long data transmission up into a number of frames. **[6]**

c. Multiplexing is a way of sending multiple signals or streams of information over a communications link at the same time in the form of a single, complex signal;

i. Explain how synchronous time division multiplexing (TDM) works. **[3]**

ii. Explain why is a statistical time division multiplexer is more efficient than a synchronous time division multiplexer. **[4]**

Question 5

a. Recently wireless LANs have come to occupy a significant niche in the local area network market and many organizations are finding that wireless LANs are an indispensable adjunct to traditional wired LANs.

i. Briefly explain **four** application areas for wireless LANs. **[8]**

ii. Describe the **two** wireless LAN Security Standards. **[4]**

b. Briefly describe **three** approaches to message authentication. **[6]**

c. Differentiate between symmetric encryption and public-key encryption. **[2]**