VIT
Vellore Institute of Technology

# Final Assessment Test – November 2024

Course: **PMCA505L - Data Communication and Networking**

Class NBR(s): **3149/3209/3248** Slot: **D2+TD2**

Time: **Three Hours** Max. Marks: **100**

- **KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE**
- **DON'T WRITE ANYTHING ON THE QUESTION PAPER**

**Answer ALL Questions**

**(10 X 10 = 100 Marks)**

1. a) Elaborate the key components and the different modes of data communication system. **[4]**

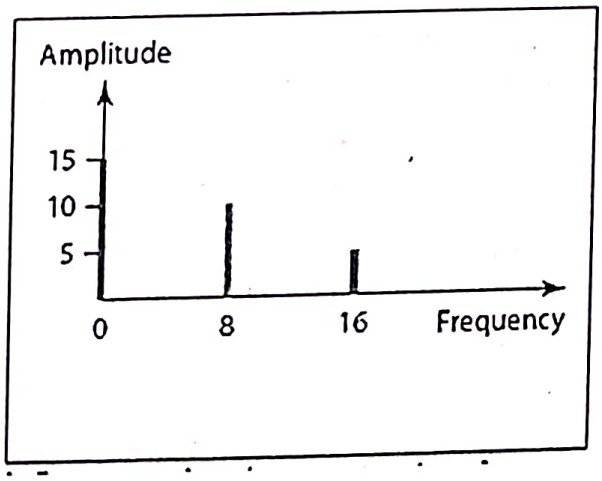
   b) Cite your own example of how the number of users, type of transmission medium and hardware can affect the performance of a network. **[6]**

2. Enumerate the services provided by layer N to layer N+1 in layered architecture based on TCP/IP service model. Identify and mention the functions of the protocol for each layer of the model.

3. Consider an Analog and Digital data signals and answer the following questions:

   a) The period of a signal is 100 ms. What is its frequency in kilohertz? **[2]**

   b) Draw a time domain graph that illustrates all the sine waves corresponding to the provided frequency domain graph. **[2]**




   c) A digital signal has 128 levels. How many bits are needed per level? **[2]**

   d) Assume you have High-Definition TV (HDTV) that uses digital signals to broadcast high quality video signals. The HDTV screen is normally a ratio of 16 : 9. There are 1920 by 1080 pixels per screen, and the screen is renewed 30 times per second. Twenty-four bits represents one color pixel. Calculate the bit rate for this HDTV. **[2]**

e) Suppose a signal travels through a transmission medium and its power is reduced to one-fourth. This means that $P_2$ is $(1/4)P_1$. Find the loss of power for the attenuated signal. The power of a signal is 10 mW and the power of the noise is 10 μW; What are the values of SNR and $SNR_{dB}$? [2]

4. a)

i) We need to send 240 kbps over a noiseless channel with a bandwidth of 20 kHz. How many signal levels do we need? [2]

ii) What are the propagation time and the transmission time for a 5-Mbyte message (an image) if the bandwidth of the network is 1 Mbps? Assume that the distance between the sender and the receiver is 12,000 km and that light travels at $2.4 \times 10^8$ m/s. [2]

iii) A network with bandwidth of 5 Mbps can pass only an average of 18,000 frames per minute with each frame carrying an average of 10,000 bits. What is the throughput of this network? [2]

b) Distinguish between multilevel TDM, multiple slot TDM and pulse-stuffed TDM. [4]

5. Do WAN technologies need any switching technique for its data to travel? Identify and explain the various switching techniques that are used for networking. Describe a scenario where message switching would be more advantageous than packet switching. Furthermore, describe a scenario where one switching technique would be more advantageous than another.

6. a) Obtain the 3-bit CRC code for the data bit sequence 1010010111 using the generator polynomial $X^3+X+1$. [5]

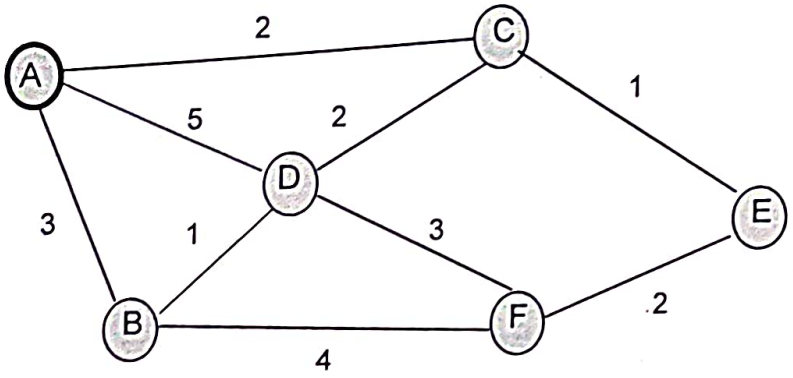
b) Compare and contrast the Go Back N ARQ protocol with Selective Repeat ARQ. [5]

7. a) Suppose a network with IP Address 200.100.50.0 is divided into 2 subnets. Find the following for each subnet: [7]

i) Total number of hosts per subnet
ii) Subnet Address
iii) First Host ID
iv) Last Host ID
v) Direct Broadcast Address
vi) Limited broadcast address
vii) Subnet Mask

b) A block of addresses is granted to a small organization. If one of the addresses is **201.101.40.15/22,** find the first address, last address and number of addresses in the block. [3]

8. Explain the steps involved in Link State Routing. Using Dijkstra algorithm, find the shortest path between node A(root node) and all other nodes.




9.a) TCP client opens a connection using an initial sequence number (ISN) of 11,000 and wants to send 3000 bytes of data in 3 TCP segments. The Server opens the connection with an ISN of 15,000 and wants to send 2000 bytes of data in single TCP segment. Show the three phases of communication between TCP client and server.

**OR**

9.b) Discuss in detail about the congestion control mechanism used in TCP.

10.a) Identify the need of DNS? Explain one scenario where DNS is very much useful for internet communication.

**OR**

10.b) Suppose a user wants to download a file from webserver to local machine. State the various steps involved for achieving it using FTP protocol how it is achieved using FTP protocol?

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