DATA COMMUNICATION AND COMPUTER NETWORK

Q1. Explain all layers of OSI model with its functions, protocol, advantages and disadvantages. (diagram)

Q2. Explain all layers of TCP model with its functions, protocol, advantages and disadvantages. (diagram)

Q3. Explain Bluetooth architecture with diagram,(piconet and scatternet).

Q4. Describe in detail IEEE 802.11 standard with its subtype.

Q5. Compare IPV4 and IPV6. (Any 8 points.)

Q6. Describe different connecting devices used in computer network. (4 mark each) (working, advantages, disadvantage, diagram) either do comparision.
1. HUB
2. Switch
3. Router
4. Reapter
5. Bridge

Q7. Describe working advantages and disadvantages multiplexing and demultiplexing techniques (diagram).

Q8. Compare FDM and TDM (diagram)

Q9. Describe message switching and packet switching and circuit switching techniques with neat diagram.(4 marks each).

Q10. Explain simplex, half duplex and full duplex modes in data communication with neat diagram.

Q11. Explain the process of DHCP server configuration.

Q12. Draw and explain block diagram of communication system.

Q13. Explain different types of Network topologies with advantages disadvantages and diagram. (start, ring, mesh, hybrid, bus, tree)

Q14. Describe construction of coaxial cable with its advantages and disadvantages (diagram).

Q15. Describe construction of fiber optic cable with its advantages and disadvantages(diagram).

Q16. Draw and explain neat diagram of twisted pair cable and state its types.

Q17. Define following term:
1. Computer network
2. Protocol
3. Bit rate
4. Baud rate
5. CRC and LRC
6. Bandwidth

Q18. Describe the components of data communication with neat diagram

Q19. Explain LRC with example.

Q20. Describe various mobile generations in detail. Or compare (1G, 2G, 3G, 4G, 5G)

Q21. Explain satellite communication and Line of sight with the help of neat diagram.

Q22. Describe the process of DHCP server configuration

Q23. Explain ARP, subnetting and supernetting with example.

Q24. Name the Protocols used in
i) Data Link Layer
ii) Network Layer
iii) Transport Layer
iv) Presentation Layer

Q25. Define IP addressing. List IP address classes with their range of addresses

Q26. Differentiate any six point between LAN and WAN and MAN.

Q27. Compare OSI and TCP/IP network model (any six point each)

Q28. Explain SMTP, HTTP protocol in detail.

Q29. Your company has the network id 165.130.0.0. You are responsible for creating subnets on the network, and each subnet must provide at least 1000 host ids. What subnet mask meets the requirement for the minimum number of host ids and provides the highest number of subnets?
The given network id 165.130.0.0 is class B (Range of class B is 128.0.0.0 to 191.255.255.255) with subnet mask of 255.255.252.0 creates 62 subnets with 1022 host each. In binary format subnet mask reads: 11111111.11111111.11111100.00000000. To calculate the number of host ids available for each subnet is based on the number of digits remaining in the network address. The number of possible host

ids in each subnet ranges from 00000001 through 11111110. So, in the network 165.130.0.0/22, host addresses can range from 165.130.0.1 through 165.130.254

Q30. Consider a network with 8 computer, which network architecture should be used peer to peer or Client Server ? Justify the answer.
Reasons to Choose Client-Server:
1. Centralized Management: In a client-server setup, a dedicated server manages resources (like files, printers, and databases) for all connected client computers. This makes network management easier and more efficient, especially as the network grows.
2. Enhanced Security: Centralized servers allow for better implementation of security measures, such as user authentication, access controls, and data encryption, which is important for protecting sensitive information.
3. Scalability: Client-server architectures can scale more effectively than P2P networks. As the organization grows or more resources are needed, additional servers can be added to handle increased demand without affecting network performance.
4. Reliable Performance: Servers are designed to handle multiple requests simultaneously, providing reliable performance for network services like file sharing and centralized backups.
Peer-to-Peer (P2P) Network:
Limitations for 8 Computers:
1. Decentralized Management: P2P networks lack centralized management, requiring each computer to act as both a client and a server. This can lead to challenges in resource management and coordination, especially as the network size increases.
2. Security Concerns: P2P networks typically have weaker security controls compared to client-server architectures, making them less suitable for organizations that require secure data handling.
3. Scalability Challenges: While P2P networks are simple and cost-effective for small-scale environments, they may struggle to maintain performance and efficiency as the number of nodes (computers) grows.

Q31. Calculate CRC for the frame 110101011 and generator Polynomial X4 + X + 1 and write the transmitted frame.
• Original Frame: 110101011
• Generator Polynomial: x 4+x+1=10011x4+x+1=10011
• CRC Calculation: Perform polynomial division (XOR operations) to compute the CRC remainder.
• Final Remainder (CRC): 1001
• Transmitted Frame: 110101011 (original frame) || 1001 (CRC)
• Therefore, the transmitted frame with CRC appended will be: Transmitted Frame: 1101010111001Transmitted Frame: 1101010111001
• (calculate using division method and then write CRC n then transmit frame

Q32. To identify and correct errors in the given bit stream encoded with VRC (Vertical Redundancy Check), LRC (Longitudinal Redundancy Check), and even parity, let's analyze the frames and perform the necessary parity checks.
1 1 0 0 0 0 1 1

1 1 1 1 0 0 1 1
1 0 1 1 0 0 1 0
0 0 0 0 1 0 1 0
0 0 1 0 1 0 1 0
0 0 1 0 1 0 1 1
1 0 1 0 0 0 1 1
0 1 0 0 1 0 1 1
1 1 1 0 0 0 0 1
```

Step 1- Each line represents a frame consisting of 8 bits.
1 1 0 0 0 0 1 1
1 1 1 1 0 0 1 1
1 0 1 1 0 0 1 0
0 0 0 0 1 0 1 0
0 0 1 0 1 0 1 0
0 0 1 0 1 0 1 1
1 0 1 0 0 0 1 1
0 1 0 0 1 0 1 1
1 1 1 0 0 0 0 1
```

Step 2: Perform Parity Checks
VRC (Vertical Redundancy Check)
- Calculate parity for each bit position (1 to 8):
```

Bit 1: Even (Count of 1s = 4) - correct
Bit 2: Even (Count of 1s = 4) - Correct
Bit 3: Even (Count of 1s = 3) - Incorrect (Should be even)
Bit 4: Odd (Count of 1s = 4) - Correct
Bit 5: Even (Count of 1s = 3) - Incorrect (Should be even)
Bit 6: Even (Count of 1s = 4) - Correct
Bit 7: Odd (Count of 1s = 5) - Incorrect (Should be even)
Bit 8: Even (Count of 1s = 4) - Correct
```

LRC (Longitudinal Redundancy Check)
- Compute LRC (XOR all bits in each frame):
```

LRC(Frame 1): 1 1 0 0 0 0 1 1 = 0 (even)
LRC(Frame 2): 1 1 1 1 0 0 1 1 = 0 (Even)
LRC(Frame 3): 1 0 1 1 0 0 1 0 = 0 (Even)
LRC(Frame 4): 0 0 0 0 1 0 1 0 = 0 (Even)
LRC(Frame 5): 0 0 1 0 1 0 1 0 = 1 (Odd)
LRC(Frame 6): 0 0 1 0 1 0 1 1 = 0 (Even)
```

LRC(Frame 7): 1 0 1 0 0 0 1 1 = 0 (Even)
LRC(Frame 8): 0 1 0 0 1 0 1 1 = 0 (Even)
LRC(Frame 9): 1 1 1 0 0 0 0 1 = 0 (Even)
```
#### Even Parity Check
- Check each frame for even parity (total count of 1s including the parity bit):
```
Frame 1: 1 1 0 0 0 0 1 1 (Count of 1s = 4) - Correct (Odd)
Frame 2: 1 1 1 1 0 0 1 1 (Count of 1s = 7) - Incorrect (Should be even)
Frame 3: 1 0 1 1 0 0 1 0 (Count of 1s = 4) - Correct (Even)
Frame 4: 0 0 0 0 1 0 1 0 (Count of 1s = 2) - Correct (Even)
Frame 5: 0 0 1 0 1 0 1 0 (Count of 1s = 3) - Incorrect (Should be even)
Frame 6: 0 0 1 0 1 0 1 1 (Count of 1s = 4) - Correct (Even)
Frame 7: 1 0 1 0 0 0 1 1 (Count of 1s = 4) - Correct (Even)
Frame 8: 0 1 0 0 1 0 1 1 (Count of 1s = 4) - Correct (Even)
Frame 9: 1 1 1 0 0 0 0 1 (Count of 1s = 5) - Incorrect (Should be even)
```
### Step 3: Correcting Errors
Based on the parity checks:
- Frame 2, Frame 5, and Frame 9 have incorrect parity (odd count of 1s).
- Adjust the bits in these frames to correct the parity (flip necessary bits to make the total count of 1s even).
### Corrected Frames:
```
Frame 2 (Corrected): 1 1 1 1 0 0 1 0 (Even)
Frame 5 (Corrected): 0 0 1 0 1 0 1 1 (Even)
Frame 9 (Corrected): 1 1 1 0 0 0 0 0 (Even)
```
### Step 4: Reconstruct Transmitted Bit Stream
Combine the corrected frames to reconstruct the transmitted bit stream:
``` 1 1 0 0 0 0 1 1
1 1 1 1 0 0 1 0
1 0 1 1 0 0 1 0
0 0 0 0 1 0 1 0
0 0 1 0 1 0 1 1
0 0 1 0 1 0 1 1
1 0 1 0 0 0 1 1
0 1 0 0 1 0 1 1
1 1 1 0 0 0 0 0

Q32. Draw suitable network layout with star topology for a computer lab with 10 hosts and a wireless printers. List all components in the Layout.

Components Needed:
1. Switch or Hub: Central networking device to connect all hosts and the printer.
2. Ethernet Cables: To connect each host to the switch/hub.
3. Wireless Access Point (WAP): To enable wireless connectivity for the printer.
4. Wireless Printer: Network printer that supports wireless connectivity.
5. Power Outlets: To provide power to the networking devices and hosts.