B.E. COMPUTER SCIENCE & ENGINEERING 3RD YEAR 1st SEMESTER SUPPLEMENTARY EXAM- 2024

COMPUTER NETWORKS

Time: 3 hours Full Marks: 100

Group A (Total Marks: 10) [CO1]
Answer Question No. 1 OR Question No. 2

1. Describe the layers of the OSI model and explain the responsibilities of each Layer. Explain with the frame structure of IEEE 802.3. How is the data encapsulation and decapsulation concept used in Ethernet 802.3? Explain with suitable diagrams. 5+5+5=10

OR

2. What are the different categories of connecting devices? Explain with layered architecture. Describe the functionality of a transparent bridge? Explain the loop problem of transparent bridges. How is hub related to a repeater? 3+3+2+2=10

Group B (Total Marks: 30) [CO2]
Answer Question No. 3 OR Question No. 4 AND Question No. 5 (Compulsory)

3. Explain why collision is an issue in random access mechanisms, but not in controlled or channelizing protocols? Explain the pure ALOHA and discuss the performance in terms of throughput. How slotted ALOHA can improve the performance? Let us consider that a 128 Kbps pure ALOHA channel is going to be shared among some number of stations. Each station will send a 512 byte frame on average every 5 seconds.
   i) What is the maximum number of stations this particular network can support?
   ii) What if this was a slotted ALOHA channel?
   3+3+3+(3+3)=15

OR

4. Explain the MAC sublayers in IEEE 802.11 standard (give a schematic representation). Describe the hidden and exposed station problems and their effects with a suitable diagram. Explain the properties of orthogonal sequences which are suitable for CDMA. Explain three strategies of CSMA/CA to avoid collisions on wireless networks. 3+3+4+5=15

5. Describe the layered architecture of Bluetooth with a suitable diagram. Explain the functionalities of the Radio layer and Baseband layer of Bluetooth. Explain the multiple secondary communication in Bluetooth. What are the two types of links between a Bluetooth primary and a secondary. 4+4+3+4=15

Group C (Total Marks: 30) [CO3]
Answer Question No. 6 (Compulsory) and Question No. 7 OR Question No. 8

6. A) Assume that an ISP is granted a block of addresses starting from 190.100.0.0/16 for Jadavpur University. The ISP needs to distribute these addresses to four groups as follows:

   i) The Faculty Council of Engineering and Technology has 128 units; each needs 256 addresses except the first and the last units. A total of 151 and 187 addresses are needed for the first and the last units respectively.
   ii) The Faculty Council of Science has 64 units; The i-th unit (except the 64-th unit) uses (64 + i) addresses. The 64-th unit uses 128 addresses.
   iii) The Faculty Council of Arts has 32 units; each needs 64 addresses. The i-th unit (except the 32-nd unit) uses (64 - i) addresses. The 32-nd unit uses 64 addresses.
   iv) Interdisciplinary Schools and Centers have 128 units; each needs 64 addresses.
   v) University Administrative Block has 8 units; each needs 32 addresses
   Design the subblocks (with schematic diagram) and find out how many addresses are still available.

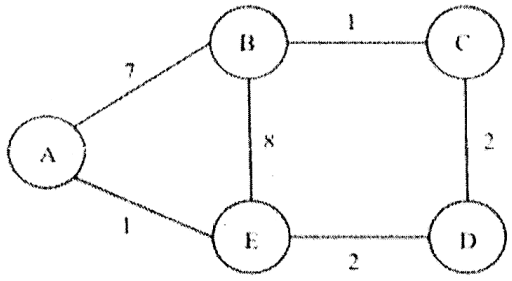
   B) Explain how a router finds the network address to route the packet in following two cases:

   i) A router outside the department of CSE receives a packet with destination address 190.240.6.92
   ii) A router inside the department of CSE receives the same packet with destination address 190.240.30.92.
   iii) Discuss what happens if this destination does not exist in these two cases.

   C) Discuss a solution to address the problem of shortage of addresses (explain with a suitable example)?

   10+3+2=15

7. Consider a network as shown in the figure below. A, B, C, D and E are the nodes. Link costs are provided along the edges. Explain the Distance Vector Routing with this example network. Discuss the instability issue of distance vector routing. What strategies can be used to solve the two-node loop instability issue? 7+4+4=15



OR

8. What is MTU and how fragmentation is related to it? Explain with a suitable diagram. How does the final destination resemble the original datagram from the fragments received? Explain with an example. Why is dynamic address configuration required? Explain a protocol to address this issue. 4+4+2+5=15

Group D (Total Marks: 30) [CO4 and CO5]
Answer Question No. 9 OR Question No 10 and Question No 11 OR Question No. 12

9. How is user datagram encapsulated in IP datagram? Why does UDP provide connectionless services? Are both UDP and IP unreliable to the same degree? Explain why or why not. How are ports implemented in UDP? Explain the background processes for port unreachable messages in this context. Why is UDP a suitable protocol for multicasting? Explain with a suitable example.

2+2+2+3+3+3=15

OR

10. Describe the three-way handshaking for connection establishment in TCP. How TCP tackles following issues (explain with suitable examples and schematic diagram of the TCP Segment): i) Sending and receiving processes write or read data at different speeds. ii) Flow Control iii) Error Control iv) Out-of-order Segments.

3+(4X3)=15

11. Explain the File Transfer Protocol in respect to control connection and data connection. Write the pseudo code for FTP implementation using TCP Socket as client-server program. 5+10=15

OR

12. Explain the architecture of e-mail in respect to SMTP, POP3 and IMAP4 and HTTP. Write the pseudo code for DNS implementation using UDP Socket as client-server program. 5+10=15