

B.E PRINTING ENGG EXAMINATION

4TH YEAR, 2ND SEMESTER EXAM, 2017

DATA COMMUNICATION & NETWORKING

Time : 3 hours

Full marks: 100

Answer any 5 questions

1. a) What do you mean by network topology? How many types of network topologies are there? Compare mesh, star and ring topologies in terms of robustness, security and complexity of reconfiguration.
b) Differentiate among the three types of data flow which are possible in a network.
c) What are the basic components of a network? Name 4 metrics by which the performance of a network is measured. What are the metrics used to measure the reliability of a network?
d) Briefly discuss any two fundamental characteristics on which the effectiveness of a data communication system depends.

[(1+2+3)+3+(2+2+3)+4=20]

2. a) What are the possible causes of transmission impairment? How can you measure the loss/gain of energy of a signal? If the power of a signal is reduced to one third while travelling through a medium, calculate the loss of power of the signal.
b) Define throughput of a network. A network with bandwidth of 10 Megabits per second can pass an average of 15,000 frames per minute with each frame carrying an average of 10,000 bits. Find the throughput of the network. What percentage of the total bandwidth of the network is utilized here?
c) Distinguish between propagation time and transmission time with reference to a network.
d) How can you measure the bit rate of a noiseless channel? Suppose we need to send data at the rate of 265 kbps over a noiseless channel with a bandwidth of 20KHz. How many signal levels do we need?

[(2+2+2)+(2+3+1)+2+(2+4)=20]

3. a) What do you mean by line coding? At which layer of the OSI model this is carried out? Draw the signal pattern using NRZ-L, RZ and Manchester encoding scheme for the bit stream 1101001.
b) What do you mean by signal to noise ratio (SNR)? What does a high SNR indicate? Calculate the bit rate of a noisy channel with bandwidth 1 MHz and SNR is equal to 63.
c) The loss in a cable is usually defined in decibels per km (dB/km). If the signal at the beginning of a cable with -0.3dB/km has a power of 2 milliWatts, what is the power of the signal at 5km apart?

[(1+1+9)+(1+1+3)+4=20]

4. a) Discuss the pattern of a data link layer frame. What is the significance of the flag field in a frame? When it is required to stuff an extra byte or a bit within a frame? Why bit stuffing is advantageous than byte stuffing?
b) How can you calculate the odd parity of a data? Explain the main drawback of a single bit parity checker with an example. How it can be overcome?
c) Suppose in the data link layer, a dataword to be transmitted by the sender is 1011. The divisor which is agreed upon both by the sender and the receiver is 1001.
Calculate the codeword which has to be actually sent to the receiver using Cyclic Redundancy Check (CRC) encoding scheme. Now show how the receiver verifies whether the received codeword is valid or corrupted.

[(3+1+2+2)+(2+2+2)+(3+3)=20]

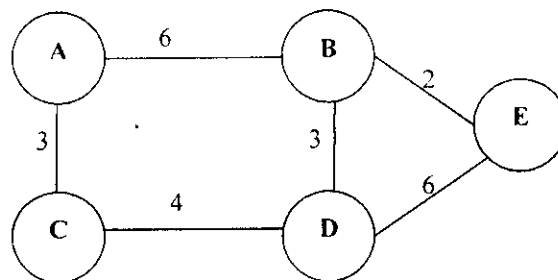
5. a) Design a receiver site algorithm for Go Back-N ARQ protocol. What are the window sizes of the sender and receiver under this protocol?
 b) Discuss the functionality of Pure ALOHA with the help of a flowchart. Why ALOHA falls under the category of random access of MAC protocols?
 c) Calculate graphically the vulnerable time for pure ALOHA. How it can be minimized?

$$[(4+2)+(6+2)+(3+3)=20]$$

6. a) What are the main differences between ALOHA and Carrier Sense Multiple Access (CSMA) protocols? Which one is advantageous between the two and in what sense?
 b) Discuss the functionality of non-persistent procedure under CSMA. How it differs from 1-persistent procedure? Which one among these two saves the bandwidth of the channel and how?
 c) Point out the drawback of CSMA. In order to overcome this drawback, which other protocol was designed? Discuss the functionality of that protocol using a flowchart.

$$[(2+2)+(2+2+2)+(2+1+7)=20]$$

7. a) What are the main functionalities of the network layer?
 b) What do you mean by autonomous system? Categorize the routing protocols based on routing within/between autonomous systems.
 c) Consider the following network. Discuss the steps of formation of routing table for node B using distance vector routing algorithm.



- d) Use Dijkstra's algorithm to form the shortest path tree for the above network considering node D as the root node. Show the steps clearly. Now formulate the routing table for this node. State the significance of each component of the Link State packet (LSP) generated by each node of the network in link state routing.

$$[2+(1+2)+6+(4+2+3)=20]$$

8. a) Discuss the **Two-node loop instability problem**. Use suitable diagrams to explain. Which type of routing algorithm results in this problem? Is that intra-domain routing or inter-domain routing?
 b) What do you mean by address depletion problem? Which type of addressing causes this problem?
 c) The IP address of a host and the subnet mask for the network are given as 172.60.50.2 and 255.255.224.0 respectively. Calculate the subnet address to which the host is connected on, the maximum number of hosts that can be connected to the network and also the range of assignable IP addresses on the above subnet.
 d) Suppose in a block of IP addresses, we know the IP address of one host is 125.34.12.56/18. Calculate the network address and the last address that can be assigned to a machine on the network. What is the maximum number of hosts that can be connected to the network?

$$[(3+1+1)+(3+1)+(2+1+3)+(2+2+1)=20]$$