

- (ii) Show the bit pattern transmitted for the message 1010110011. Assume that even parity is used in the Hamming code.

7. (a) What are the advantages and disadvantages of using satellite as a communication medium? (5)

(b) Write short notes on the following: (2*5=10)

(i) Hub

(ii) ICMP

(iii) Bridge

(iv) WWW

(v) SMTP

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5853

J

Unique Paper Code : 2342573601

Name of the Paper : Computer Networks

Name of the Course : **B.A. (Prog.) /B.Sc. (Phy. Sc.)
/B.Sc. Maths. Sc. (NEP-UGCF)**

Semester : VI

Duration : 3 Hours

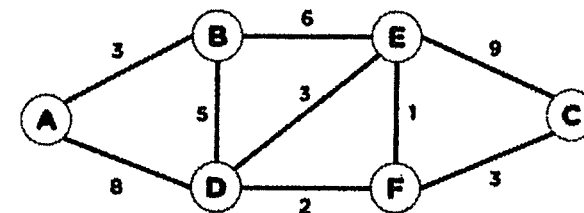
Maximum Marks : 90

Instructions for Candidates

1. Write your Roll. No. on the top immediately on receipt of this question paper.
2. **Section A (Question No. 1)** is compulsory.
3. Attempt any **four** questions from Section B (Questions 2 to 7).
4. All questions in **Section B** carry equal marks.
5. Parts of a question must be answered together.

Section A

1. (a) For each of the following three networks, discuss the consequences if a connection fails: (3)
 - (i) Four devices arranged in a mesh topology
 - (ii) Four devices arranged in a bus topology
 - (iii) Four devices arranged in a ring topology
- (b) Assume that a voice channel occupies a bandwidth of 2 kHz. We need to multiplex 7 voice channels with guard bands of 250 Hz using FDM. Calculate the minimum required bandwidth. (3)
- (c) Describe simplex, half-duplex, and full-duplex modes of communication. (3)
- (d) What are the purposes of the URG, SYN, and PSH flags in a TCP header? (3)
- (e) Discuss the purpose of cladding in Optical Fibers. (3)



6. (a) What is a Subnet Mask? If you were given a subnet mask of 255.255.255.192, how many hosts could each subnet accommodate? (2+2=4)
- (b) Describe the UDP header format with the help of a diagram. Give one example of a scenario where UDP packets are used for data transmission. (5)
- (c) Ten-bit messages are transmitted using a Hamming code. (3+3=6)
 - (i) How many check bits are needed to ensure that the receiver can detect and correct single-bit errors?

$x^4 + x + 1$. Compute the bit stream transmitted, which includes the message and CRC. Suppose that the third bit from the left is inverted during transmission. Show that this error is detected at the receiver's end. (3+2=5)

(c) What are the key characteristics of radio waves and microwaves? (6)

5. (a) Discuss the basic difference between a switch, repeater, router, and gateway. (4)

(b) What is the CSMA/CD protocol? What is the minimum frame size required to ensure collision detection in the CSMA/CD protocol? (3+2=5)

(c) Consider the following network with the indicated link cost. Using the shortest path Algorithm, find the shortest path from source node A to F and from A to C. (6)

(f) What is the function of the IP protocol in routing data across networks? (3)

(g) What are the main roles of the Data Link Layer in network communication? (3)

(h) Using Nyquist's theorem, calculate the maximum bit rate for a noiseless channel with a bandwidth of 4 kHz transmitting a signal with four distinct signal levels. (3)

(i) HTTP is a stateless protocol. Justify. (3)

(j) Find the class of the following IP addresses. (3)

(i) 208.34.54.12

(ii) 238.34.2.1

(iii) 129.14.6.8

Section B

2. (a) What is the use of checksum in data communication, and how does it help in detecting errors during data transmission? (1+2=3)
- (b) What are the key differences between virtual-circuit and datagram networks? (5)
- (c) List different layers of the TCP/IP reference model and briefly describe the responsibility of the Transport layer in TCP/IP. (3+4=7)
3. (a) Consider an extremely noisy channel in which the value of the signal- to-noise ratio is 31. Compute the bit rate if the bandwidth of the channel is 1 kHz. (4)
- (b) What is the need for multiplexing in computer networks? Discuss the types of multiplexing. (2+3=5)

- (c) The following character encoding is used in a data link protocol: A: 01000111 B: 11100011 FLAG: 01111110 ESC: 11100000

Show the bit sequence transmitted (in binary) for the Six-character frame

A B ESC FLAG FLAG B

When each of the following framing methods is used:

- (i) Flag bytes with byte stuffing.
- (ii) Starting and ending flag bytes with bit stuffing. (2*3=6)
4. (a) Define HDLC protocol. Which OSI layer does it belong to, and how does it work? (1+1+2=4)
- (b) A message $M(x)$ 10110010 is transmitted using the CRC method. The generator polynomial is