

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1402 C
Unique Paper Code : 32341303
Name of the Paper : BHCS12 - Computer Networks
Name of the Course : B.Sc. (H) Computer Science
(CBCS-LOCF)
Semester : III
Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **Section A** is compulsory and carries 35 marks.
3. Attempt any four questions from **Section B**.
4. All questions carry equal marks.

SECTION A

1. (a) Consider a selective repeat sliding window protocol that uses a frame size of 1 KB to send data on a 1.5 Mbps link with a one-way latency of 50 msec. To achieve a link utilization of 60%, what is the minimum number of bits required to represent the sequence number field. (3)

P.T.O.

(b) Give any one difference between port address, physical address and logical address? (3)

(c) Suppose the following character encoding is used in a data link protocol : (2)

A: 11010111; B: 11101101; FLAG: 01111110; ESC: 10100011.

Consider the character frame: A B ESC B ESC ESC FLAG

Show the bit sequence transmitted (in binary) for the above character frame when Flag bytes with byte stuffing framing methods is used.

(d) Explain the significance of the following special IP addresses :

(i) 127.0.0.0

(ii) 255.255.255.255 (2)

(e) Explain the difference between packet switching and circuit switching with the help of suitable example. (3)

(f) How are IP addresses resolved from a given URL? (3)

(g) Five channels each with a 100 KHz bandwidth are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 10 KHz bandwidth channels to prevent interference. (2)

- (h) In a given modulation scheme, there are 4 amplitude levels and 16 phase levels and the bit rate (N) is 72 Kbps. Calculate the following:
- (i) Number of bits per baud (r)
 - (ii) Baud rate (S) (2)
- (i) Indicate True or False for each of the following :
- (i) Switches in circuit-switched networks involve connection establishment and connection release.
 - (ii) Switches in circuit-switched networks do not need any information about the network topology to function correctly. (2)
- (j) What is the benefit of "twisting" in twisted-pair cables? (2)
- (k) What is the purpose of PSH and SYN flag bits with respect to TCP header? (2)
- (l) What do you mean by well-known ports? Mention the port numbers assigned to HTTP and SMTP. (2)
- (m) Assume six devices are arranged in a mesh topology. How many ports are needed for each device? How many physical links are needed in full duplex mode? (2)

- (n) Which of the four digital to analog modulation techniques (ASK, FSK, PSK) is most susceptible to noise? Justify your answer. (2)
- (o) Map the following to a suitable layer of the OSI model :
- (i) Route determination
 - (ii) Interface to transmission media
 - (iii) Provides access to the end user (3)

SECTION B

2. (i) Consider a coding scheme with two legal codewords: 01010 and 10101.
- (a) Calculate its Hamming distance.
 - (b) How many bit errors can be detected by this code?
 - (c) How many bit errors can be corrected by this code? (3)
- (ii) A 12-bit even-parity Hamming code whose binary value is 111001001111 arrives at a receiver. What was the original value of the message? Assume that not more than 1 bit is in error. (3)

(iii) Explain and discuss the various fields of IP header with the help of a diagram. (4)

3. (i) HyperText Transfer Protocol (HTTP) is a stateless protocol. Justify. (2)
- (ii) A router has the following (CIDR) entries in its routing table : (2)

Address/mask	Next hop
135.46.56.0/22	Interface 0
135.46.60.0/22	Interface 1
192.53.40.0/23	Router 1
default	Router 2

For each of the following IP addresses, find the next hop selected by the router?

- (a) 135.46.63.10
- (b) 192.53.56.7
- (iii) Two CSMA/CD stations are each trying to transmit long (multiframe) files. After each frame is sent, they contend for the channel, using the binary exponential backoff algorithm. Explain the functionality of the algorithm in brief. (3)

- (iv) Compare and contrast Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) with respect to the following parameters:
- Connection
 - Sequence of Data packets at the receiver
 - Acknowledgement of the received packets
- (3)

4. (i) Compute the Nyquist Sampling rate for a signal with bandwidth of 200 KHz if the lowest frequency is 100 KHz. (2)

(ii) Differentiate between static and dynamic routing with the help of suitable example. (3)

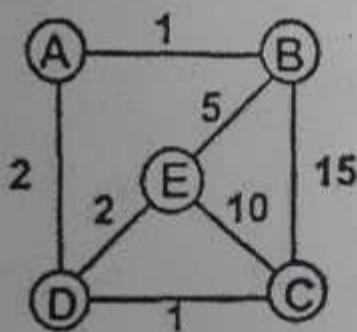
(iii) A message $M(x)$ 1101101101 is transmitted using the CRC method. The generator polynomial is $x^3 + 1$. (3+2)

(a) Compute the transmitted bit string which includes the message and CRC.

(b) Suppose that the fifth bit from the left is inverted during transmission. Show that this error is detected at the receiver's end.

5. (i) Suppose a 9000-byte IP packet is forwarded across a link with a 1500-byte Maximum Transmission Unit (MTU). How many fragments will be created ? What are their lengths? (2)
- (ii) How can a machine with a single DNS name have multiple IP addresses? (2)
- (iii) Consider the IP address 184.86.92.182,
- (a) Find the class of the given IP address, if we are using class-based addressing.
 - (b) If the network in part (a) is to be divided into 8 different subnets, what would be the subnet mask?
 - (c) What is the network address of the subnet to which this IP address would be attached?
 - (d) For CIDR addressing, find the length of CIDR prefix for the network in part (c). (1+2+2+1)
6. (i) What is the importance of flow control in the context of network communication? Suggest any one technique used to handle the issue of flow control. (3)

- (ii) Briefly discuss the concept of multiplexing. Differentiate between Time Division and Frequency division Multiplexing. (3)
- (iii) Consider the network shown below and assume that each node initially knows the costs to each of its neighbors. Consider the distance vector algorithm and show the distance table entries at node E. (4)



7. (i) Why is the header checksum of an IP packet computed at every hop from source to destination? (2)
- (ii) DNS uses UDP instead of TCP. If a DNS packet is lost, there is no automatic recovery. Does this cause a problem, and if so, how is it solved? (2)
- (iii) State Optimality Principle. (3)
- (iv) Explain the concept of transmission impairment? Briefly, discuss the difference between distortion and attenuation. (3)