

**B.TECH/IT/6<sup>TH</sup> SEM/INFO 3202/2019**  
**COMPUTER NETWORK**  
**(INFO 3202)**

**Time Allotted : 3 hrs**

**Full Marks : 70**

*Figures out of the right margin indicate full marks.*

*Candidates are required to answer Group A and  
any 5 (five) from Group B to E, taking at least one from each group.*

*Candidates are required to give answer in their own words as far as  
practicable.*

**Group – A**  
**(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) What is the maximum number of IP addresses that can be assigned to hosts on a local subnet that uses the 255.255.255.224 subnet mask?  
(a) 14                    (b) 6                    (c) 62                    (d) 30.
  - (ii) In HDLC(High-level Data Link Control) protocol, which frame is used to transport control information?  
(a) I- frame            (b) S-frame            (c) V-frame            (d) Piggybacking.
  - (iii) Domain, which is used to map an address to a name is called  
(a) generic domains                    (b) inverse domain  
(c) main domains                    (d) sub-domains.
  - (iv) In the slow start phase of the TCP congestion control algorithm, the size of the congestion window  
(a) does not increase                    (b) increases linearly  
(c) increases quadratically                    (d) increases exponentially.
  - (v) What is the maximum size of data that the application layer can pass to TCP layer ?  
(a) Any size                    (b)  $2^{16}$  bytes-size of TCP header  
(c)  $2^{16}$  bytes                    (d) 1500 bytes.
  - (vi) Which of the following statements is FALSE regarding a bridge?  
(a) Bridge is a layer 2-device  
(b) Bridge reduces collision domain  
(c) Bridge is used to connect two or more LAN segments  
(d) Bridge reduces broadcast domain.

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- (vii) Size of receiver window of go-back-n protocol (n is the number of sequence bits) is always  
(a)  $2^n - 1$                     (b)  $2^0$                     (c)  $2^{n-1}$                     (d) same as sender window size.
- (viii) One of the header fields in an IP datagram is the Time to Live (TTL) field. Which of the following statements best explains the need for this field?  
(a) It can be used to prioritize packets  
(b) It can be used to reduce delays  
(c) It can be used to optimize throughput  
(d) It can be used to prevent packet looping.
- (ix) Match the following:  
(P) SMTP                    (1) Application layer  
(Q) BGP                    (2) Transport layer  
(R) TCP                    (3) Data link layer  
(S) PPP                    (4) Network layer  
(5) Physical layer  
(a) P – 2 Q – 1 R – 3 S – 5                    (b) P – 1 Q – 4 R – 2 S – 3  
(c) P – 1 Q – 4 R – 2 S – 5                    (d) P – 2 Q – 4 R – 1 S – 3.
- (x) Which one of the following statements is FALSE?  
(a) Packet switching leads to better utilization of bandwidth resources than circuit switching  
(b) Packet switching results in less variation in delay than circuit switching  
(c) Packet switching requires more per packet processing than circuit switching  
(d) Packet switching can lead to reordering unlike in circuit switching.

**Group – B**

2. Explain in detail, how communication is taking place starting from connection establishment, data transfer and connection termination in  
(i) circuit switching and (ii) packet switching **6 + 6 = 12**
3. (a) Explain the functions of network layer and transport layer in brief.  
(b) Let the received codeword be 110110101110. Using Hamming code try to correct the codeword if single bit error has occurred.  
(c) What are the criteria to select generator polynomial (g(x)) to detect all single bit error in CRC? **(3 + 3) + 4 + 2 = 12**

**Group – C**

4. (a) A 20 Kbps satellite link has a propagation delay of 400 ms. The transmitter employs the “go back n ARQ” scheme with window size of 10. Assuming that each frame is 100 bytes long, calculate the efficiency of the protocol.
- (b) Show the bit pattern that will be transmitted if you want to transmit 01111100111110 using bit stuffing.
- (c) Show that “The efficiency of slotted ALOHA protocol is twice compared to the pure ALOHA protocol”.

$$5 + 3 + 4 = 12$$

5. (a) Prove that efficiency of stop-n-wait ARQ technique is  $1/(1+2a)$ , where  $a = \text{propagation time} / \text{frame transmission time}$ .
- (b) A 2 km long broadcast LAN has 107 bps bandwidth and uses CSMA / CD. The signal travels along the wire at  $2 \times 10^8$  m/sec. What is the minimum packet size that can be used on this network?
- (c) What do you mean by persistency in CSMA/CD protocol?

$$6 + 4 + 2 = 12$$

**Group – D**

6. (a) Suppose you need to subnet a network that has five subnets, each with at least 16 hosts. Find the suitable subnet mask address.
- (b) Host A sends a UDP datagram containing 8880 bytes of user data to host B over an Ethernet LAN. Ethernet frames may carry data up to 1500 bytes. Size of UDP header is 8 bytes and size of IP header is 20 bytes. There is no option field in IP header. How many total number of IP fragments will be transmitted and what will be the contents of flags and offset field in the first, 4th and last fragments?
- (c) Compare distance vector and link state routing algorithm.

$$3 + 6 + 3 = 12$$

7. (a) An organization needs a total of 15 subnets divided into following blocks:--  
 2 subnets each with 128 addresses  
 2 subnets each with 64 addresses  
 2 subnets each with 32 addresses  
 3 subnets each with 16 addresses  
 3 subnets each with 8 addresses  
 3 subnets each with 4 addresses  
 An ISP provides a network address 172.16.2.0/22, to the organization. Design the subnets.  
 Find out how many addresses are still available after this allocation.

- (b) Explain the working principle of BGP.

$$(7 + 2) + 3 = 12$$

**Group – E**

8. (a) Sender opens a TCP connection with an ISN of 25010 and receiver opens the connection with an ISN of 25010. Draw the TCP segments during the connection establishment and termination.
- (b) Make a comparative study between open-loop and close-loop congestion control techniques.
- (c) Define QoS requirement for FTP and video conferencing applications.

$$(3 + 3) + 3 + 3 = 12$$

9. (a) Let the size of the congestion window of TCP connection be 64KB when a timeout occurs. The RTT of the connection is 50ms and MSS is 2KB. How much time is taken by the TCP to get back to 64KB congestion window?
- (b) Explain the token bucket algorithm.
- (c) Write short note on Nagle’s algorithm.

$$5 + 4 + 3 = 12$$