Advanced Computer Network (CSEN 5203)

Time Allotted: 3 hrs Full Marks: 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and <u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> 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: $10 \times 1 = 10$ (i) Match the following protocols with layers: (select the most appropriate) Protocols: (A) SMTP (B) BGP (C) TCP (D) PPP (2) Transport layer Protocol Layers: (1) Application layer (3) Data link layer (4) Network layer (a) A-1, B-4, C-2, D-3 (b) A-2,B-3,C-4,D-1 (c) A-1,B-2,C-3,D-4 (d) A-4,B-3,C-2,D-1. (ii) Which of the following is not part of WLAN? (b) Virtual Channel (a) CSMA (c) NAV Collision Detection. (d) (iii) Which of the following relates to e-Mail protocol? Sendmail (a) (b) smtp All the above. (c) pop (d) (iv) Match the following: (select the most appropriate) A) NFS 1) ICMP B) Telnet 2) UDP C) ping 3) TCP D) ARP 4) Link Laver (a) A-1,B-2,C-3,D-4 A-2,B-3,C-1,D-4 (b) (c) A-4.B-3,C-2,D-1 (d) A-2,B-1,C-4,D-1. (v) Choose the correct option: (a) ARP is MAC-to-IP mapping, RARP is IP-to-MAC mapping ARP is MAC-to-IP mapping, RARP is MAC-to-MAC mapping (b) ARP is IP-to-MAC mapping, RARP is MAC-to-IP mapping (c) ARP is MAC-to-IP mapping, RARP is MAC-to-IP mapping. (vi) A subset of a network that includes all the routers but contains no loops is called

(a) spanning tree

(c) spider tree

(b) spider structure

(d) none of the mentioned.

- (vii) Choose the most appropriate:
 - (a) BGP is Distance Vector, OSPF is Link State
 - (b) BGP is Distance Vector, OSPF is Distance Vector
 - (c) BGP is Link State, OSPF is Link State
 - (d) BGP is Link State, OSPF is Distance Vector.
- (viii) Which of the following is correct?
 - (a) Flow Control in the Link Layer is Rate Based
 - (b) Flow control is a primary responsibility of the Physical Layer
 - (c) Feedback based flow control is established in the Link Layer
 - (d) The Network and the Transport Layers need not have explicit flow control mechanism.
- (ix) A coding mechanism uses a transition in the middle of a bit transmission. For sending bit '1' it uses 0 to 1 transition in the middle. For sending bit '0', it uses a 1 to 0 transition. Which of the following is true for this code?
 - (a) The bit rate is doubled
 - (b) The bit rate is halved
 - (c) The bit rate remains the same
 - (d) None of the above.
- (x) What are the sizes of the IP address and Port Number in IPv4 (in bits)?
 - (a) 32, 32

(b) 16, 16

(c) 16, 32

(d) 32, 16.

Group - B

- 2.(a) Explain p-persistent CSMA/CD protocol.
 - (b) An Ethernet Network consists of a few nodes with transmission capacity 10^5 bps. The maximum distance between any two nodes in the network is 300 mtrs. (Assume speed of light is 3 x 10^{10} cm/sec). How much time would be required to detect a collision in the worst case? Please explain your answer briefly.
 - (c) For Satellite communication which one of the following is not suitable Go-Back-N or Sliding Window?
 - (d) Why is a modem required for signal transmission? Explain the most important principle behind high-speed modem design.

3+3+2+(2+2)=12

- 3.(a) Distance between two stations is x km. Transmission capacity of the channel is y bps. Each frame is z bits in length. Assume propagation speed of light is c km/sec. Processing delay is negligible. What would be the maximum window size if a sliding window protocol is followed?
 - (b) How does the RTS/CTS mechanism solve the Hidden and Exposed Terminal problem?
 - (c) What is Backward Learning algorithm used by bridges?

5+4+3=12

Group - C

4.(a) Design a subnetting scheme for an assigned network (IP) address: 198.60.12.0.

LAN A contains 30 machines

LAN B contains 60 machines

LAN C contains 30 machines

LAN D contains 60 machines

Assign subnet addresses in that order (i.e. addresses for LAN A to appear earlier than LAN B etc.). In particular show the starting and ending addresses for each LAN and individual subnet masks.

- (b) In CIDR, how is the netmask specified? How is it different from class based mechanism?
- (c) What are the IPv4 addresses not available for assigning to hosts?

6+(2+2)+2=12

- 5.(a) Describe the steps for the Link State Routing protocol with an example.
 - (b) Mention how the following design choices can help in solving IPv4 address scarcity problem:
 - i) NAT
- ii) CIDR
- (c) Mention only the main steps (no explanation required) of the AODV routing protocol. 4+4+4=12

Group - D

- 6.(a) Prove the inequality: $(m + r + 1) \le 2^r$, where m is the number of message bits and r is the number of check bits required to detect all single bit errors.
 - (b) What do you mean by Virtual Circuit and Datagram? Virtual Circuit is a circuit switching technology comment whether this is correct or not.
 - (c) How is FHSS different from FDM?

4+(4+2)+2=12

- 7.(a) In a CDMA system suppose these are two stations A and B with chip codes 1010 and 1100 respectively. A sends bits '1','1','0', idle information in successive four bit intervals. B sends in the same time idle,'0','1','1'.
 - i) Describe algebraically the transmitted signals by A,B, in the channel and receiver output at three decoders that use chip codes for A,B and something else (say 0110).
 - ii) Show the same information as above using a suitable timing diagram.
 - (b) WLAN / BlueTooth / Zigbee all use the free ISM band. Will there be any conflict if they operate simultaneously?

(5+5)+2=12

Group - E

- 8.(a) Explain how the following design choices can be used to make an unreliable protocol (like UDP) behave like a reliable protocol?
 - i) Sequence No
- ii) Retransmission
- iii) Timeout
- iv) Buffering.

- (b) Show a typical NAT table and explain it.
- (c) Suppose you are designing a new client-server oriented application in the Internet. What are the parameters you need to agree upon to make the client / server communication happens? Show the corresponding "socket" code in both the client & the server. You may assume any language of your choice. Also just show the code for the communication part only no need to write the actual application logic.

4+4+(2+2)=12

- 9.(a) A Token Bucket has a capacity of 9600 KB. Tokens are generated @ 25 MB/sec. How long can this system support a burst of 125 MB/sec.? (Answer should be in milliseconds).
 - (b) What is meant by Congestion Control? Is it a Network Layer or a Transport Layer responsibility? Mention a known technique of Congestion Control.
 - (c) The TCP connection establishment is a 3-way handshaking process whereas the teardown is a 2-way one explain briefly.

4+(2+1+3)+2=12