Sardar Patel Institute of Technology

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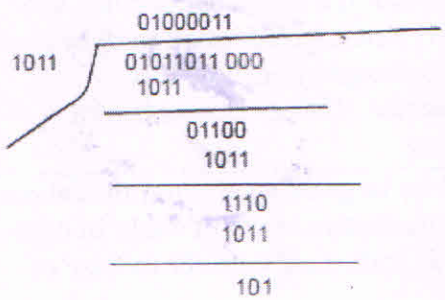
(Autonomous College Affiliated to University of Mumbai)

End Semester Examination
November 2018

Max. Marks: 60 **Duration:180 Minutes**
Class: T.E **Semester: V**
Course Code: IT52 **Branch: IT**
Name of the Course: Computer Networks

Instructions:
(1) All Questions are Compulsory
(2) Draw neat diagrams
(3) Assume suitable data if necessary

Question No.		Max. Marks	CO
Q 1 (a)	What are the key benefits of layered network? (Any 3) Main benefits of layered network are given below: i)Complex systems can be broken down into understandable subsystems. ii)Any facility implemented in one layer can be made visible to all other layers. iii)Services offered at a particular level may share the services of lower level. iv)Each layer may be analyzed and tested independently. v)Layers can be simplified, extended or deleted at any time. vi)Increase the interoperability and compatibility of various components build by different vendors. What do you mean by Service Access Point? In layered network, each layer has various entities and entities of layer i provide service to the entities of layer i+1. The services can be accessed through service access point (SAP), which has some address through which the layer i+1 will access the services provided by layer. What do you mean by Protocol? What it determines? What are its key elements? In the context of data networking, a protocol is a formal set of rules and conventions that governs how computers exchange information over a network medium.It determines what is communicated, how it is communicated and when it is communicated. The key elements of a protocol are syntax, semantics and timing.	8	1
Q1(b)	Why does single-mode fibers are used for large distance communications rather than multi-mode fibers? What is maximum length of cable in each of above mode?What devices are used as source and detector in case of single mode of fiber? Ans:LASER is used as source and photodiode is used as detector in case of single mode of fiber .	4	2

	1.In a multi-mode fiber, the quality of signal-encoded light deteriorates more rapidly than single-mode fiber because of interference of many light rays. 2. As a consequence, single-mode fiber allows longer distances without repeater. For multi-mode fiber, the typical maximum length of the cable without a repeater is 2km, whereas for single-mode fiber it is 20km.		
Q2(a)	Host A is sending data to host B over a full duplex link. A and B are using the sliding window protocol for flow control. The send and receive window sizes are 5 packets each. Data packets (sent only from A to B) are all 1000 bytes long and the transmission time for such a packet is 50 µs. Acknowledgement packets (sent only from B to A) are very small and require negligible transmission time. The propagation delay over the link is 200 us. What is the maximum achievable throughput in this communication? Throughput=(1window/RTT) RTT=transmission delay+2*propagation delay=50microsec+2*200microsec=450microsec Now Throughput=((5*1000)/450microsec) =11.11bytes per second	2	4
Q.2(b)	A network with CSMA/CD protocol in the MAC layer is running at 1 Gbps over a 1 km cable with no repeaters. The signal speed in the cable is 2 x 108 m/sec. The minimum frame size for this network should be? Frame Size S >= 2BL/P Cable Length L = 1KM = 1000M Propogation Speed P = 2 x 10^8 m/sec Bandwidth = 1 Gbps = 10^9 bps S >= (2 * 10^9 * 1000) / (2 x 10^8) >= 10000 bits	2	
Q 2(c)	The message is 01011011and uses $x^3 + x + 1$ as the generator polynomial to generate the check bits. What message will be transmitted to reciver? Message transmitted will be 01011011101 	2	4

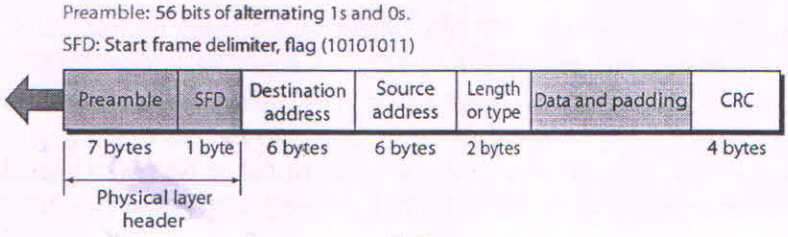
Draw and explain Ethernet frame format. What should be the minimum pay load length and why? | 6

Minimum pay laod 46 bytes as minimum frame length is 64 bytes.

PREAMBLE – Ethernet frame starts with 7-Bytes Preamble. This is pattern of alternative 0's and 1's which indicates starting of the frame and allow sender and receiver to establish bit synchronization.

SFD: This is a 1-Byte field which is always set to 10101011. SFD indicates that upcoming bits are starting of frame, which is destination address.

- **Destination Address** – This is 6-Byte field which contains the MAC address of machine for which data is destined.
- **Source Address** – This is a 6-Byte field which contains the MAC address of source machine. As Source Address is always an individual address (Unicast), the least significant bit of first byte is always 0.
- **Length** – Length is a 2-Byte field, which indicates the length of entire Ethernet frame. This 16-bit field can hold the length value between 0 to 65534, but length can not be larger than 1500 because of some own limitations of Ethernet.
- **Data** – This is the place where actual data is inserted, also known as **Payload**. Both IP header and data will be inserted here, if Internet Protocol is used over Ethernet. The maximum data present may be as long as 1500 Bytes. In case data length is less than minimum length i.e. 46 bytes, then padding 0's is added to meet the minimum possible length.
- **Cyclic Redundancy Check (CRC)** – CRC is 4 Byte field. This field contains 32-bits hash code of data, which is generated over Destination Address, Source Address, Length and Data field. If the checksum computed by destination is not same as sent checksum value, data received is corrupted.



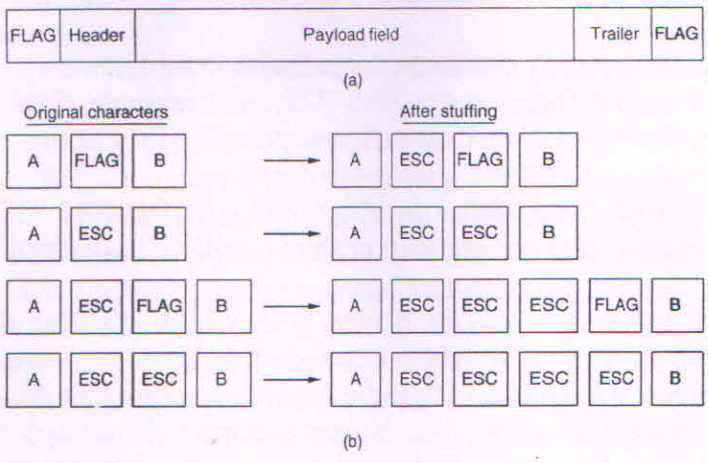
OR

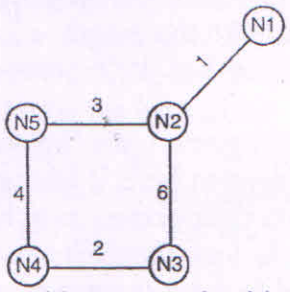
A bit-stuffing based framing protocol uses an 8-bit delimiter pattern of 01111110. If the output bit-string after stuffing is 01111100101, then the input bit-string is ---? Justify your answer.

8-bit delimiter pattern is 01111110.

The output bit-string after stuffing is 01111100101

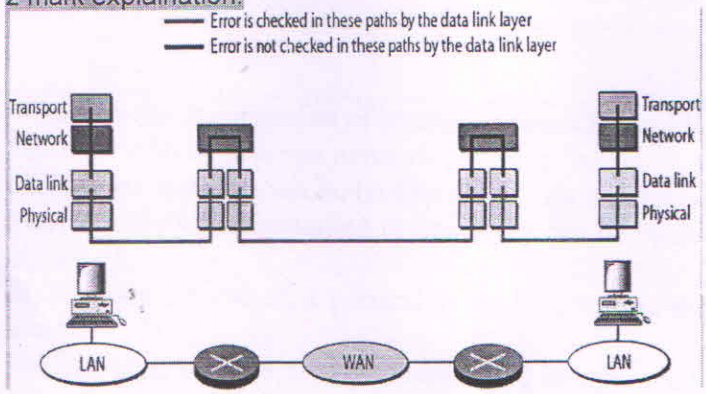
Explain flag bytes with byte stuffing framing method with neat diagram.



Q3 (a)	 Consider a network with five nodes, N1 to N5, as shown above. The network uses a Distance Vector Routing protocol. Once the routes have stabilized, the distance vectors at different nodes are as following. N1:(0,1,7,8,4) N2:(1,0,6,7,3) N3:(7,6,0,2,6) N4:(8,7,2,0,4) N5:(4,3,6,4,0) The link N1-N2 goes down. N2 will reflect this change immediately in its distance vector as cost, ∞. But before N2 ,N4 sends its update to N3. After the NEXT ROUND of update, what will be cost to N1 in the distance vector of N3? In the next round, N3 will receive distance from N2 to N1 as infinite. It will receive distance from N4 to N1 as 8. So it will update distance to N1 as 8 + 2.	2	3
	Differentiate between Datagram Packet Switching and Virtual Circuit Packet Switching in tabular form for 3 different points.	3	

Q3 (b)	An IP router with a Maximum Transmission Unit (MTU) of 1500 bytes has received an IP packet of size 4404 bytes with an IP header of length 20 bytes. The values of the relevant fields in the header of the third IP fragment generated by the router for this packet are? Number of packet fragments = ⌈ (total size of packet)/(MTU) ⌉ = ⌈ 4404/1500 ⌉ = ⌈ 2.936 ⌉ = 3 So Datagram with data 4404 byte fragmented into 3 fragments.	5	3
	The first frame carries bytes 0 to 1479 (because MTU is 1500 bytes and HLEN is 20 byte so the total bytes in fragments is maximum 1500-20=1480). the offset for this datagram is 0/8 = 0. The second fragment carries byte 1480 to 2959. The offset for this datagram is 1480/8 = 185. finally the third fragment carries byte 2960 to 4404.the offset is 370 and for all fragments except last one the M bit is 1.so in the third bit M is 0..		
	An IPV4 packet has arrived with the first 8 bits as 01000010. The receiver discards the packet why? Error in packet. 1st 4 bit show version which is correct. The next 4 bits (0010) show an invalid header length (2*4=8). The minimum number of bytes in the header must be 20.The packet has been corrupted in transmission.	2	
	OR		
	A company has a class C network address of 204.204.204.0. It wishes to have three subnets, one with 100 hosts and two with 50 hosts each. Derive subnet mask, show subnet with neat diagram diagram Subnet mask ½ marks. Each subnet 1 marks. Subnet mask: 255.255.255.128. 1) 11001100.11001100.11001100.10000000/11111111.11111111.11111111.10000000 –> Network bits-25 (as 25 bits are 1 in the subnet mask) so sub-network id == 204.204.204.128 , 7 bits '0' in subnet mask,i.e. 128(i.e. 2^7)-2=126 hosts . 2) Subnet mask: 255.255.255.64		

	11001100.11001100.11001100.01000000/11111111.11111111.11111111.11000000 –> Network bits-26 (as 25 bits are 1 in the subnet mask) so sub-network id == 204.204.204.64 , 6 bits '0' in subnet mask,i.e. 64(i.e.2^6)-2=62 hosts. 3) Subnet mask: 255.255.255.64 11001100.11001100.11001100.00000000/11111111.11111111.11111111.11000000 –> Network bits-26 (as 26 bits are 1 in the subnet mask) so sub-network id == 204.204.204.0 (refer(2)) 6 bits '0' in subnet mask,i.e. 64(i.e.2^6)-2=62 host bits . This satisfies the minimum criteria of 50,50 and 100 hosts and all subnet IDs are different. Assume that source S and destination D are connected through two intermediate routers labeled R. Determine how many times each packet has to visit the network layer and the data link layer during a transmission from S to D  n-4 and d= 6		
Q4 (a)	State correct order in which a server process must invoke the function calls accept, bind, listen, and recv according to UNIX socket API? bind, listen, accept, recv Consider an instance of TCP's Additive Increase Multiplicative Decrease (AIMD) algorithm where the window size at the start of the slow start phase is 2 MSS and the threshold at the start of the first transmission is 8 MSS. Assume that a timeout occurs during the fifth transmission. Find the congestion window size at the end of the tenth transmission with neat diagram. Diagram 1 marks. Each transmission 1/2 marks. Here AIMD is used to avoid congestion. If threshold is reached, window size will be increased linearly. If there is timeout, window size will be reduced to half. Window size for 1st transmission = 2 MSS Window size for 2nd transmission = 4 MSS Window size for 3rd transmission = 8 MSS threshold reached, increase linearly (according to AIMD) Window size for 4th transmission = 9 MSS Window size for 5th transmission = 10 MSS time out occurs, resend 5th with window size starts with as slow start. Window size for 6th transmission = 2 MSS	2 + 6	4

	Window size for 7th transmission = 4 MSS threshold reached, now increase linearly (according to AIMD) Additive Increase: 5 MSS (since 8 MSS isn't permissible anymore) Window size for 8th transmission = 5 MSS Window size for 9th transmission = 6 MSS Window size for 10th transmission = 7 MSS.		
	Need of flow control and error control at transport layer: Yes. To provide end to end flow control and error control. –ie reliability. 2 mark diagram. 2 mark explaination.  	4	4
Q5(a)	Compare TCP and UDP for 4different points. Each point 1/2 marks	4	4
Q5(b)	SPIT student from his Dahanu residence want to connect to application server at SPIT ,Andheri for doing his project work and create results that can be transferred to his local site. Which application layer protocol he will use and why? Justify your answer. Which application protocol- 1 mark Justification -3 mark. He will use TELNET- a general client / server program that lets user access any applicationprogram on a remote computer. After logging on, he can use the services available on the remote computer and transfer results back to the local computer. Though FTP and SMTP are available , it would be difficult to write a specific client server program for each demand.	4	4
Q5(c)	How heterogeneity problem is resolved in FTP? File transfer inFTP means which 3 things? Marks-heterogeneity 1 mark, 3 marks- file transfer means. Hetrogeneity problem: file type, data structure and transmission mode. RETR,STOR,LIST.	4	4