GATE CS Topic wise Questions

Computer Network

YEAR 2003

Question. 1

Which of the following assertions is false about the internet Protocol (IP) ?

(A) It is possible for a computer to have multiple IP addresses

(B) IP packets from the same source to the same destination can take different routes in the network

(C) IP ensures that a packet is farwarded if it is unable to reach its destination within a given number of hopes

(D) The packet source cannot set the route of an outgoing packets; the route is determined only by the routing tables in the routers on the way.

SOLUTION

Internet protocol ensures that a packet is forwarded if it is unable to reach its destination within a given no. of hops. One computer can have multiple IP addresses also packets having same source & destination can take different routes.

Source doesn't decide where to route the packet, but it is decided by the routing tables at intermediate routers.

Hence (D) is correct option.

Question. 2

Which of the following functionalities must be implemented by a

transport protocol over and above the network protocol ?

(A) Recovery from packet losses

(B) Detection of duplicate packets

(C) Packet delivery in the correct order

(D) End to end connectivity

SOLUTION

Transport protocols are mainly for providing end to end connections by making sockets.
Recovery from packet loss & delivery in correct order, duplication is checked by Data link layer.
Hence (D) is correct option.

Question. 3

The subnet mask for a particular network is 255.255.31.0 Which of the following pairs of IP addresses could belong to this network ?

(A) 172.57.88.62 and 172.56.87.23.2

(B) 10.35.28.2 and 10.35.29.4

(C) 191.203.31.87 and 191.234.31.88

(D) 128.8.129.43 and 128.8.161.55

SOLUTION

(A) Given subnet mask 255.255.31.0

11111111 .11111111 .00011111 .00000000

Option (A) & (C) has 16 MSB's different so IP address can't belong to same network.

In option (B) & (C) let us see LSB's.

	28.2	00011100.00000010
(B)	29.4	00011101.00000101
	Anding with	00011111. 0000000

Both give different results. So not possible.

(D)	129.43	10000001.00101011
	Anding	00011111.00000000
		00000001.00000000

$$\begin{array}{rl} & 10100001.00110111 \\ 161.55 & \underline{00011111.00000000} \\ & 00000001.00000000 \end{array}$$

Both belong to same network.

Hence (D) is correct option.

Question. 4

A 2 km long brodcast LAN has 10^7 bps bandwidth and uses CSMA/CD. The signal travels along the wire at 2×10^8m/s. What is the minimum packet size that can be used on this network ?

(A) 50 bytes (B) 100 bytes

(C) 200 bytes (D) None of the above

SOLUTION

$$\begin{aligned} \text{Total distance for RTT} &= 4 \text{ Km} \\ \text{Transfer rate} &= 2 \times 10^8 \text{ ms}^{-1} \\ \text{Time to transfer} &= \frac{4 \times 10^3}{2 \times 10^8} \\ &= 2 \times 10^{-5} \text{ sec} \\ \text{Data rate} &= 10^7 \text{ bps} \\ \text{Packet size} &= 2 \times 10^{-5} \times 10^7 \text{ bytes} \\ &= 200 \text{ bytes} \end{aligned}$$

Hence (C) is correct option.

Question. 5

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. Acknowledgment packets (sent only from B to A), are very small and require negligible transmission time. The propagation delay over the link is 200 μs. What is the maximum achievable throughput in this communication ?

(A) 7.69×10^6bps (B) 11.11×10^6bps

(C) 12.33×10^6bps (D) 15.00×10^6bps

SOLUTION

$$\begin{aligned}
\text{Data packet size} &= 1000 \text{ bytes} \\
\text{No. of packets} &= 5 \\
\text{Total data} &= 5000 \text{ bytes.} \\
\text{Propagation delay} &= 200\ \mu s \\
\text{Transmission time} &= 50\ \mu s/\text{Packet.} \\
\text{So far 5 packets} &= 50 \times 5\ = 250 \mu s \\
\text{Total time for 5 packets} &= 250 + 200\ = 450 \mu s \\
\text{Rate} = \frac{\text{Data}}{\text{Time}} &= \frac{5000}{450 \times 10^{-6}} \\
&= 11.11 \times 10^6 \text{ bps}
\end{aligned}$$

Hence (B) is correct option.

YEAR 2004

Question. 6

Choose the best matching Group 1 and Group 2.

Group-1	Group-2
P. Data link layer	1. Ensures reliable transport of data over a physical point-to-point link
Q. Network layer	2. Encodes/ decodes data for physical transmission
R. Transport layer	3. Allowed-to-end communication between two processes

(A) P-1, Q-4, R-3 (B) P-2, Q-4, R-1

(C) P-2, Q-3, R-1 (D) P-1, Q-3, R-2

SOLUTION

Transport layer is responsible for end to end communication, creation of sockets.

Network layer routes the data from one node to other, till it reach to destination. Datalink layer ensures reliable data transfer by error correction, duplication check ordered delivery etc.

$P-1, Q-4, R-3$

Hence (A) is correct option.

Question. 7

Which of the following is NOT true with respective to a transparent bridge and a router ?

(A) Both bridge and router selectively farward data packets

(B) A bridge uses IP addresses while a router uses MAC addresses

(C) A bridge builds up its routing table by inspecting incoming packets

(D) A router can connect between a LAN and a WAN.

SOLUTION

Bridge is the device which work at data link layer whereas router works at network layer. Both selectively forward packets, build routing table & connect between LAN & WAN but since bridge works at data link it uses MAC addresses to route whereas router uses IP addresses.
Option (B) is false.
Hence (B) is correct option.

Question. 8

How many 8-bit characters can be transmitted per second over a 9600 baud serial communication link using asynchronous mode of transmission with one start bit, eight data bits, and one parity bit ?

(A) 600 (B) 800

(C) 876 (D) 1200

SOLUTION

Baud is the symbol which is sent over the link, baud = 9600 bits 18 bit character has baud size of 12 bits.

So no. of characters $= \frac{9600}{12}$

$= 800$

Hence (B) is correct option.

Question. 9

A and B are the only two stations on an Ethernet. Each has a steady queue of frames to send. Both A and B attempt to transmit a frame,

collide, and A wins the first backoff race, At the end of this successful transmission by A, both A and B attempt to transmit and collide. The probability that A wins the second backoff race is

(A) 0.5 (B) 0.625

(C) 0.75 (D) 1.0

SOLUTION

A wins the first back off race the conditions are (0,1)
After that during second back off four conditions (0,1,2,3)

$$\text{Probably} = \frac{1}{2} \times \frac{3}{4} \times \frac{1}{2} \times \frac{1}{2}$$

$$= \frac{3}{8} + \frac{1}{4}$$

$$= \frac{5}{8} = 0.625$$

Hence (B) is correct option.

Question. 10

The routing table of a router is shown below :

Destination	Subnet Mask	Interface
128.75.43.0	255.255.255.0	Eth 0
128.75.43.0	255.255.255.128	Eth 1
192.12.17.5	255.255.255.255	Eth 3
deraulf		Eth 2

On which interface will the router farward packets addressed to destinations 128.75.43.16 and 192.12.17.10 respectively ?

(A) Eth 1 and Eth 2 (B) Eth 0 and Eth 2

(C) Eth 0 and Eth 3 (D) Eth 1 and Eth 3

SOLUTION

Given IP Address
128.75.43.16. (1)
Eth 0 128.75.43.0. (2)
Mask 255.255.255.0.

Equation (1) & (2) both are of same network.

	192.12.17.10.	(1)
Eth 3	192.12.17.5.	(2)
Mask	255.255.255.255.	

Equation (1) & (2) both are of same network
Hence (C) is correct option.

Data for Q. 11 & 12 are given below.

Solve the problems and choose the correct answers.

Consider three IP networks A, B and C. Host H_A in network A send messages each containing 180 bytes of application data to a host H_C in network C. The TCP layer prefixes a 20 byte header to the message. This passes through an intermediate network B. The maximum packet size, including 20 byte IP header, in each network is

A :1000 bytes
B :100 bytes
C :1000 bytes

The network A and B are connected through a 1 Mbps link, while B and C are connected by a 512 Kbps link (bps=bits per second).

Question. 11

Assuming that the packets are correctly delivered, how many bytes, including headers, are delivered to the IP layer at the destination for one application message, in the best case ? Consider only data packets.

(A) 200 (B) 220
(C) 240 (D) 260

SOLUTION

At A Data + Header = 200 bytes
This would require only 1 packet of N/W A
At B 200 bytes of payload from network A is packed in 80 payload + 20 header packet.

This would require

20+80 20+80 20+40

Packets total 260 bytes.

These are transferred to C.

Hence (D) is correct option.

Question. 12

What is the rate at which application data is transferred to host H_c ? Ignore errors, acknowledgements, and other overheads.

(A) 325.5 Kbps (B) 354.5 Kbps

(C) 409.6 Kbps (D) 512.0 Kpps

SOLUTION

200 byte at 1 Mbps

$$\text{Time} = \frac{200 \times 8}{10^6} \text{ sec}$$

260 byte at 512 kbps or .5 Mbps

$$\text{Time} = \frac{260 \times 8 \times 2}{10^6}$$

$$\text{So rate of data transfer} = \frac{\text{Total data}}{\text{total time}}$$

$$= 354.5 \text{ Kbps}$$

Hence (B) is correct option.

YEAR 2005

Question. 13

Packets of the same session may be routed through different paths in

(A) TCP, but not UDP (B) TCP and UDP

(C) UDP but not TCP (D) Neither TCP, nor UDP

SOLUTION

Selection of any path during routing of a packet is done at Network layer not at transport layer, So TCP & UDP both have nothing to do with this.

Hence (D) is correct option.

Question. 14

The address resolution protoc0l (ARP) is used for

(A) Finding the IP address from the DNS

(B) Finding the IP address of the default gateway

(C) Finding the IP address that corresponds to a MAC address

(D) Finding the MAC address that corresponds to an IP address

SOLUTION

Address resolution protocol is applied to determine MAC address corresponding to an IP address.
Hence (D) is correct option.

Question. 15

The maximum window size for data transmission using the selective reject protocol with n-bit frame sequence numbers is

(A) 2^n (B) 2^{n-1}

(C) $2^n - 1$ (D) 2^{n-2}

SOLUTION

n bit frame sequence nos are used so possible are 2^n nos.

But sending & receiving window together so $\frac{2^n}{2} = 2^{n-1}$
Hence (B) is correct option.

Question. 16

In a network of LANs connected by bridges, packets are set from one LAN to another through intermediate bridges. Since more than one path may exist between two LANs, packets may have to be routed through multiple bridges. Why is the spanning tree algorithm used for bridge-routing ?

(A) For shortest path routing between LANs

(B) For avoiding loops in the routing paths

(C) For fault tolerance

(D) For minimizing collisions

SOLUTION

Spanning tree algorithm for a graph is applied to find a tree free of cycles, so in this network we apply spanning tree algorithm to remove loops in routing paths.
Hence (B) is correct option.

Question. 17

An organization has a class B network and wishes to form subnets for 64 departments. The subnet mask would be

(A) 255.255.0.0 (B) 255.255.64.0

(C) 255.255.128.0 (D) 255.255.255.0

SOLUTION

Class B has subnet mask = 255.255.0.0
We require 64 more subnets so 2^6.
6 bits are required.
255.255.11111100.00000000
255.255. 252.0
Hence (D) is correct option.

Question. 18

In a packet switching network, packets are routed from source to destination along a single path having two intermediate node. If the message size is 24 bytes and each packet contains a header of 3 bytes, then the optimum packet size is

(A) 4 (B) 6

(C) 7 (D) 9

SOLUTION

Packet switched network message = 24 byte
Header size = 3
Case 1 If packet size = 4
Then data = 4 – 3 = 1 byte only
So require 24 packets

Case 2 Packet size 6

$$\text{Data} = 6 - 3 = 3$$

Require 8 pakets.

Case 3 $\quad$ Packet size $= 7$

$$\text{Data} = 7 - 3 = 4$$

$$\text{Require } \frac{24}{4} = 4 \text{ packets.}$$

Case 4 $\quad$ Packet size $= 9$

$$\text{Data} = 9 - 3 = 6$$

$$\text{Require} = \frac{24}{6} = 4 \text{ packets.}$$

So min requirement is in case 4.
Hence (D) is correct option.

Question. 19

Suppose the round trip propagation delay for a 10 Mbps Ethernet having 48-bit jamming signal is 46.4 μs. The minimum frame size is :

(A) 94 $\quad$ (B) 416

(C) 464 $\quad$ (D) 512

SOLUTION

$$\text{Link speed} = 10 \text{ Mbps}$$

$$\text{Delay} = 46.4 \text{ μs}$$

$$\text{Total bits transferred} = 10 \times 46.4 \times 10^6 \times 10^{-6}$$

$$= 464 \text{ bits.}$$

But 48 bit jamming signal also required.

$$\text{So frame size} = 464 + 48$$

$$= 512 \text{ bits}$$

Hence (D) is correct option.

YEAR 2006

Question. 20

For which one of the following reason: does Internet Protocol (IP) use the time-to-live (TTL) field in the IP datagram header?

(A) Ensure packets reach destination within that time

(B) Discard packets that reach later than that time

(C) Prevent packets from looping indefinitely

(D) Limit the time for which a packet gets queued in intermediate routers

SOLUTION

IP use TTL (Time to Live) field in IP datagram header to check whether the datagram is later than its correct reach time.
So if current time is greater than TTL then discard the packet.
Hence (B) is correct option.

Question. 21

Station A uses 32 byte packets to transmit messages to Station B using a sliding window protocol. The round trip delay between A and B is 80 milliseconds and the bottleneck bankwidth on the path between aA and B is 128 kbps. What is the optimal window size that A should use ?

(A) 20 (B) 40

(C) 160 (D) 320

SOLUTION

$$\begin{aligned}
\text{Path bandwidth} &= 128 \text{ kbps} \\
\text{Time delay} &= 80 \text{ ms} \\
\text{Total data} &= 80 \times 128 \times 10^3 \times 10^{-3} \text{ bits} \\
&= \frac{80 \times 128}{8} \text{ bytes} \\
&= 1280 \text{ bytes.} \\
\text{1 packet size} &= 32 \text{ byte} \\
\text{No. of packets} &= \frac{1280}{32} \\
&= 40
\end{aligned}$$

Hence (B) is correct option.

Question. 22

Two computers C1 and C2 are configured as follows. C1 has IP address 203. 197.2.53 and netmask 255.255. 128.0. C2 has IP address 203.197.75.201 and netmask 255.255.192.0. Which one of the following statements is true?

(A) C1 and C2 both assume they are on the same network

(B) C2 assumes C1 is on same network, but C1 assumes C2 is on a different network

(C) C1 assumes C2 is on same network, but C2 assumes C1 is on a different network

(D) C1 and C2 both assume they are on different networks

SOLUTION

	$C1$	$C\,2$
IP Addr	203.197. 2.53	203.197. 75.201
Mask	255.255.128.0	255.255.192.0
N/W ID	203.197. 0.0	203.197. 64.0

Both are at different networks but.

	$C1$	$C\,2$
	203.197. 2.53	203.197. 75.201
	255.255.192.0	255.255.128.0
N/W	203.197. 0.0	203.197. 0.0

Interchanging of mask by C_1 gives the same N/W ID as $C\,1$ originally has for $C\,2$ so $C\,1$ assumes that $C\,2$ is one same network, but $C\,2$'s subnet doesn't given same N/W ID so.
C_2 assumes $C\,1$ is not in same network.
Hence (C) is correct option.

Question. 23

Station A needs to send a message consisting of 9 packets to Station B using a siding window (window size 3) and go-back-n error control strategy. All packets are ready and immediately available for transmission. If every 5th packet that A transmits gets lost (but no acks from B ever get lost), then what is the number of packets that A will transmit for sending the message to B ?

(A) 12 (B) 14

(C) 16 (D) 18

SOLUTION

Sender		Receiver	
Time	Packet no.	Time	Packet status
1	1	1	ACK

2	2	2	ACK
3	3	3	ACK
4	4	4	ACK
5	5	5	Lost
6	6	6	Discard
7	5 resend	7	ACK
8	6	8	ACK
9	7	9	ACK
10	8	10	ACK
11	9	11	Lost
12	9 resend	12	

Total time = 12

Hence (A) is correct option.

Question. 24

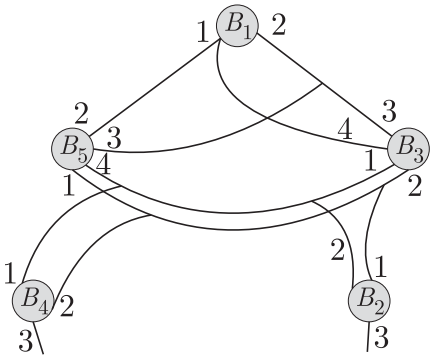
For the given connection of LANs by bridges, which one of the following choices represents the depth first traversal of the a panning tree of bridges?

(A) B1,B5,B3,B4,B2 (B) B1,B3,B5,B2,B4

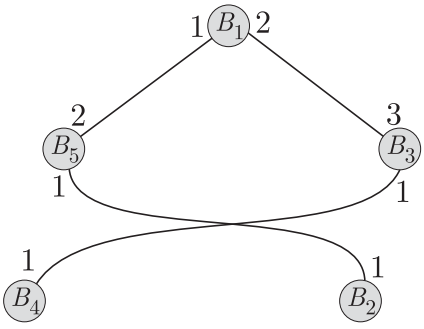
(C) B1,B5,B2,B3,B4 (D) B1.B3.B4.B5.B2

SOLUTION

Graph of bridge



Spinning tree



Hence (C) is correct option.

Question. 25

Consider the correct spanning tree for the previous question. Let host H1 send out a broadcast ping packet. Which of the following options represents the correct for forwarding table on B3?

(A)

Hosts	Ports
H1,H2,H3,H4	3
H5,H6,H9,H10	1
H7,H8,H11,H12	2

(B)

Hosts	Port
H1, H2	4
H3, H4	3
H5, H6	1
H7, H8, H9, H10	2
H11, H12	

(C)

Hosts	Port
H1, H2, H3, H4	3
H5, H6, H9, H10	1
H7,H8, H11, H12	2

(D)

Hosts	Port
H1, H2, H3, H4	3
H5, H7, H9, H10	1
H7, H8, H11, H12	4

SOLUTION

From the given graph's spanning tree port 1, 2, 3 of bridge 3 are used to access.

Port	1	H5	H6	H9	H10
	2	H7	H8	H11	H12
	3	H1	H2	H3	H4

Hence (A) is correct option.

YEAR 2007

Question. 26

In Ehernet when manchester encoding is used, the bit rate is

(A) Half the baud rate (B) Twice the baud rate

(C) Same as the baud rate (D) None of these

SOLUTION

In Manchester encoding each bit is described by 2 voltage levels. So bit rate becomes twice the band rate.
Hence (B) is correct option.

Question. 27

Which one of the following uses UDP as the transport protocol?

(A) HTTP (B) Telnet

(C) DNS (D) SMTP

SOLUTION

HTTP & SMTP uses TCP to make calls. DNS which is used for mapping names to IP addresses uses UDP to make function calls.
Hence (C) is correct option.

Question. 28

There are n stations in a slotted LAN. Each station attempts to transmit with a probability p in each time slot. What is the probability that ONLY one station transmits in a given time slot?

(A) $np(1-p)^{n-1}$ (B) $(1-p)^{n-1}$

(C) $p(1-p)^{n-1}$ (D) $1-(1-p)^{n-1}$

SOLUTION

Using binomial theorem.

Prob. that only 1 station $= n_{c_1}(p)^1(1-p)^{n-1}$ transmits.

$$= \frac{n!}{(n-1)!}p(1-p)^{n-1}$$

$$= np(1-p)^{n-1}$$

Hence (A) is correct option.

Question. 29

In a token ring network the transmission speed is 10 bps and the propagation speed is 200 metres/μs. The 1-bit delay in this network is equivalent to;

(A) 500 metres of cable (B) 200 metres of cable

(C) 20 metres of cable (D) 50 metres of cable

SOLUTION

$$\begin{aligned}\text{Transmission speed} &= 10^7 \text{ bps}\\ \text{Propagation speed} &= 200 \text{ m/}\mu\text{s}\\ \text{or } &2 \times 10^8 \text{ m/s}\\ 10^7 \text{ bps} &= 2 \times 10^8 \text{ mps}\\ 1 \text{ bit} &= \frac{2 \times 10^8}{10^7} \text{ m}\\ &= 20 \text{ m of cable}\end{aligned}$$

Hence (C) is correct option.

Question. 30

The address of a class B host is to be split into subnets with a 6-bit subnet number. What is the maximum number of subnets and the maximum number of hosts in each subnet?

(A) 62 subnets and 262142 hosts

(B) 64 subnets and 262142 hosts

(C) 62 subnets and 1022 hosts

(D) 64 subnets and 1024 hosts

SOLUTION

Class B subnet mask.
255.255.0.0
6 bits are used for subnetting
255.255.11111100.00000000
255.255.252.0

Using 6 bits $2^6 = 64$ combination

Can be made but 000 000 & 111 111 are used for default & broadcasting.
So 62 subnets possible.
Similarly for addressing host we have 10 bits $2^{10} = 1024$ addresses.
But all O's & all 1's are not used so 1022 addresses for hosts.
Hence (C) is correct option.

Question. 31

The message 11001001 is to be transmitted using the CRC polynomial $x^3 + 1$ to protect it from errors. The message that should be transmitted is:

(A) 11001001000 (B) 11001001011

(C) 11001010 (D) 110010010011

SOLUTION

$$\begin{aligned}\text{Message} &= 11001001\\ \text{Polynomial} &= x^7+x^6+x^3+1\\ \text{CRC polynomial} &= x^3+1\end{aligned}$$

$$\begin{array}{r|l} & x^4+x^3-x \\ \hline x^3+1 & x^7+x^6+x^3+1 \\ & -x^7 \qquad\qquad \pm x^4 \\ \hline & x^6-x^4+x^3+1 \\ & -x^6 \quad \pm x^3 \\ \hline & -x^4+1 \\ & \pm x^4 \quad \mp x \\ \hline & x+1 \end{array}$$

$x+1$ is remained three bit binary CRC is 011
So CRC checked 11001001011
Hence (B) is correct option.

Question. 32

The distance between two stations M and N is L kilo metres. All frames are K bits long. The propagation delay per kilo metre is t seconds Let R bits/second be the channel capacity. Assuming that processing delay is negligible, the minimum number of bits for the sequence number field in a frame for maximum utilization, when the sliding window protocol is used, is;

(A) $\left\lceil \log_2 \frac{2LtR+2K}{K} \right\rceil$ (B) $\left\lceil \log_2 \frac{2LtR}{K} \right\rceil$

(C) $\left\lceil \log_2 \frac{2LtR+K}{K} \right\rceil$ (D) $\left\lceil \log_2 \frac{2LtR+K}{2K} \right\rceil$

SOLUTION

$$\begin{aligned}\text{Dist between source \& lest L Km}&\\ \text{Propagation delay} &= \tau \text{ sec/km}\\ \text{Total delay} &= Lt\\ \text{Frame size} &= K \text{ bits}\\ \text{Capacity of channel} &= R \text{ bit/sec}\\ \text{RTT} &= 2L\tau \text{ sec}\end{aligned}$$

To get no. of bits we require no. of frames, required

$$\text{Total data} = 2\text{Lt} \times \text{R} \Rightarrow \text{rate} \times \text{time}$$
$$= 2LtR \text{ bits}$$
$$\text{No. of frames} = \frac{2LtR}{K}$$

Let n bits required for sequence no.

$$2^n = \frac{2LtR}{K}$$

$$n = \log_2\left[\frac{2LtR}{K}\right]$$

Hence (B) is correct option.

Question. 33

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

SOLUTION

SMTP (Simple mail transfer Protocol) is application layer based.
BGP is network layer based.
TCP (Transport Control Protocol) is transport layer based.
PPP (Point to Point protocol) is data link layer based protocol.
Hence (B) is correct option.

YEAR 2008

Question. 34

What is the maximum size of data that the application layer can pass on to the TCP layer below?

(A) Any size
(B) 2^{16} bytes-size of TCP header
(C) 2^{16} bytes
(D) 1500 bytes

SOLUTION

Application layer pass data to TCP layer. The length is of 16 bits. So total length 2^{16} bytes. But this is not complete payload, it has header also. So actual data.
2^{16} bytes − Size of TCP header

Hence (B) is correct option.

Question. 35

In the slow start phase of TCP congesting control algorithm, the size of the congestion window
(A) Does not increase
(B) Increases linearly
(C) Increases quadratically
(D) Increases exponentially

SOLUTION

Slow start is one of the algorithm that TCP uses to control congestion inside the network, also known as exponential growth phase, here the TCP congestion window size is increased.
Hence (D) is correct option.

Question. 36

If a class *B* network on the Internet has a subnet mask of 255.255.248.0, what is the maximum number of hosts per subnet?
(A) 1022
(B) 1023
(C) 2046
(D) 2047

SOLUTION

Class B subnet mask
255.255.0.0
Given subnet mask including subnetting
255.255.248.0

i.e 255.255.11111000.00000000
Since 5 bits used for subnetting so.

$2^5 = 32$ subnets possible

& 11 bits are used for host address.

2^{11} hosts allowed $= 2048$ hosts.

But00000000 000 & 11111111 111
Address for host not allowed, 2046 hosts possible.
Hence (C) is correct option.

Question. 37

A computer on a 10Mbps network is regulated by atoken bucket. The token bucket is filled at a rate of 2Mbps. It is initially filled to capacity with 16Megabits. What is the maximum duration for which the computer can transmit at the full 10Mbps?

(A) 1.6 seconds (B) 2 seconds
(C) 5 seconds (D) 8 seconds

SOLUTION

Initially filled = 16 Mb
Bucket fill rate = 2 Mbps

Time (sec)	Bucket (Mbps)
0	16
1	$16 - 10 + 2 = 8$
1.8	$8 - 8 + 1.6$
2	$1.6 - 2 + .4 = 0$

At $t = 0$ 16 Mb are there.

$t = 1$ 10 Mb are transmitted but 2 Mb are filled in taken bucket

$t = 1.8$ 8 Mb are transmitted but $2 \times .8 = 1.6$ Mb are filled.

$t = 2$ 1.6 Mb are transmitted with $2 \times .2 = .4$ Mb.

Hence (B) is correct option.

Question. 38

A client process P needs to make a TCP connection to a server Process S. Consider the following situation; the server process S executes a socket (), a bind() and a listen () system call in that order, following which it is preempted. Subsequently, the client Process P

executes a socket () system call followed by connect () system call to connect to the server process S. The server process has not executed any accept() system call. Which one of the following events could take place?

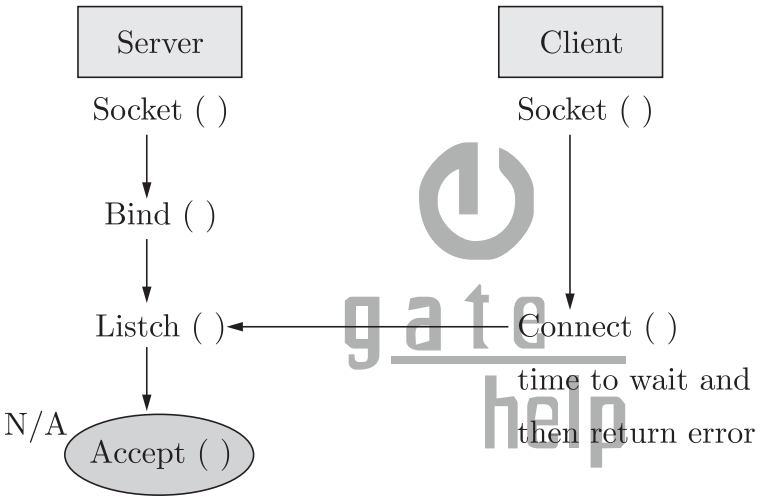
(A) connect ( ) system call returns successfully

(B) connect ( ) system call blocks

(C) connect ( ) system call returns an error

(D) connect ( ) system call results in a core dump

SOLUTION



Since accept ( ) call is not executed then connect ( ) gets no response for a time stamp to wait & then return no response server error.
Hence (C) is correct option.

YEAR 2009

Question. 39

In the RSA public key cryptosystem, the private and the public keys are (e, n) and (d, n) respectively, where $n = p^*$ and p and q are large primes. Besides, n is public and p and q are private. Let M be an integer such that $0 < M < n$and $\phi(n) = (p-1)(q-1)$. Now consider the following equations.

I. $M' = M^e \bmod n$

$M = (M')^d \bmod n$

II $ed \equiv 1 \bmod n$

III $ed \equiv 1 \bmod \phi(n)$

IV $M' = M^e \bmod \phi(n)$

$M = (M')^d \bmod \phi(n)$

Which of the above equations correctly represent RSA cryptosystem ?

(A) I and II (B) I and III

(C) II and IV (D) III and IV

SOLUTION

RSA is an algorithm for public key cryptography
Involves a public & one private key.
We choose 2 different prime nos P & Q.

Compute $n = pq$

Calculate $\phi(pq) = (p-1)(q-1)$ (Euler's tolient function)

Select e and exponent where $1 < e < \phi(pq)$
Select d where $ed - 1$ is divisible by $\phi(pq)$
So condition are

$M' = M^e \bmod n$ eneryption

$M = (M') \bmod n$ decryption

& $ed = 1 \bmod \phi(n)$

I & III
Hence (B) is correct option.

Question. 40

While opening a TCP connection, the initial sequence number is to be derived using a time-of-day (ToD) clock that keeps running even when the host is down. he low order 32 bits of the counter of TOD clock is to be used for the initial sequence numbers. The clock counter increments once per millisecond. The maximum packet lifetime is given to be 64s.

Which one of the choices given below is closet to the minimum permissible rate at which sequence numbers used for packets of a connection can increase ?

(A) 0.015/s (B) 0.064/s

(C) 0.135/s (D) 0.327/s

SOLUTION

$$\text{Packet life time} = 64 \text{ sec}$$
$$\text{Increment time} = 1 \text{ ms}$$
$$\text{So rate of generation of packets} = \frac{64}{1} \text{ ms}$$
$$= .064/\text{sec}$$

Hence (B) is correct option.

Question. 41

Let$G(x)$ be the generator polynomial used for CRC checking. What is the condition that should be satisfied by $G(x)$ to detect odd number of bits in error ?

(A) $G(x)$ contains more than two terms

(B) $G(x)$ does not divide $1 + x^k$, for any K not exceeding the frame length

(C) $1 + x$ is a factor of $G(x)$

(D) $G(x)$ has an odd number of terms

SOLUTION

In this case polynomial generator should satisfy

(A) Polynomial generated shouldn't be divisible by x

(B) It should be divisible by $1 + x$ i.e $(1 + x)$ is a factor of polynomial

Hence (C) is correct option.

Statement for Linked Answer Question 42 & 43

Frames of 1000 bits are sent over a 10^6 bps duplex link between two hosts. The propagation time is 25 ms. Frames are to be transmitted into to maximally pack them in transit (within the link).

Question. 42

What is the minimum number of bits (l) that will be required to represent the sequence numbers distinctly ? Assume that no time gap needs to be given between transmission of two frames.

(A) $l = 2$ (B) $l = 3$

(C) $l = 4$ (D) $l = 5$

SOLUTION

$$\begin{aligned}
\text{Link capacity} &= 10^6 \text{ bps} \\
\text{Propagation time} &= 25 \text{ cms} \\
\text{Total data} &= 10^6 \times 25 \times 10^{-3} \\
&= 25 \text{ kb} \\
\text{Frame size} &= 1000 \text{ bits} \\
\text{No. of frames} &= \frac{25 \times 1000}{1000} \\
&= 25 \\
2^5 = 32 \;\; 2^4 &= 16
\end{aligned}$$

So sequence nos required for 25 frames should have $l = 5$ bits.
Hence (D) is correct option.

Question. 43

Suppose that the sliding window protocol is used with the sender window size of 2^l, where l is the number of bits identified in the earlier part and acknowledgements are always piggy backed. After sending 2^l frames, what is the minimum time the sender will have to wait before starting transmission of the next frame ? (Identify the closest choice ignoring the frame processing time)

(A) 16 ms (B) 18 ms

(C) 20 ms (D) 22 ms

SOLUTION

$$\begin{aligned}
l &= 5 \text{ here} \\
2^l &= 32
\end{aligned}$$

Total 32 frames of 1000 bits each need to be sent.

$$\text{Time} = \frac{32 \times 1000}{10^6} = 32 \text{ m sec}$$

Time taken by first acknowledgement

$$\begin{aligned}
&= 2 \times RTT \\
&= 2 \times 25 = 50 \text{ ms} \\
\text{Time to wait} &= 50 - 32 \\
&= 18 \text{ m sec}
\end{aligned}$$

Hence (B) is correct option.

YEAR 2010

Question. 44

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

SOLUTION

Time to live field in IP datagram signifies the time stamp for which that packet is valid, if it reaches to a particular hop late than this time stamp it needed to be discorded. This prevents looping of packets.
Hence (D) is correct option.

Question. 45

Which one of the following is not a client-server application ?

(A) Internet chat (B) Web browsing

(C) E-mail (D) Ping

SOLUTION

Internet- Chat is maintained by chat servers, web browsing is sustained by web servers, E-mails are stored at mail servers, but ping is an utility which is used to identify connection between any two computer. One can be client, other can be client or server anything but aim is to identify whether connection exists or not between the two.
Hence (D) is correct option.

Question. 46

Suppose computers A and B have IP addresses 10.105.1.113 and 10.105.1.91 respectively and they both use the same netmask N. Which of the values of N given below should not be used if A and B should belong to the same network ?

(A) 225.255.255.0 (B) 255.255.255.128

(C) 255.255.255.192 (D) 255.255.255.224

SOLUTION

	A	B
	10.105. 1.113	10.105. 1.91
(A)	255.255.255.0	255.255.255.0
IP Addr	10.105. 1.0	10.105. 1.0
N/W Addr		

So addresses belong to same N/W.

	255.255.128	255.255.255.128
(B)	01110001	01011011
	10000000	10000000
N/W Addr	10.105.1.0	10.105. 1. 0

Same network

	10.105. 1.01110001	10.105. 1.01011011
(C)	255.255.255.11000000	255.255.255.11000000
	10.105. 1.01000000	10.105. 1.01000000

Same network

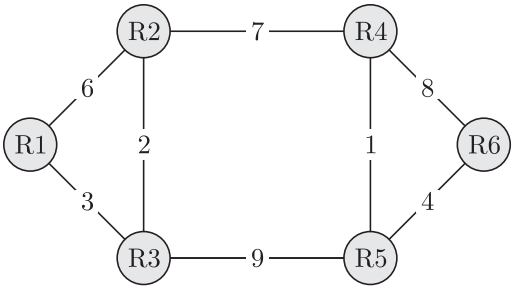
	10.105. 1.01110001	10.105. 1.01011011
(D)	255.255.255.11100000	255.255.255.11100000
	10.105. 1.01100000	10.105. 1.01000000

N/W id's differ so different network

Hence (D) is correct option.

Statement for Linked Answer Questions 47 & 48

Consider a network with 6 routers R1 and R6 connected with links having weights as shown in the following diagram.



Question. 47

All the routers use the distance vector based routing algorithm to update their routing tables. Each starts with its routing table initialized to contain an entry for each neighbour with the weight of the respective connecting link. After all the routing tables stabilize, how many links in the network will never be used for carrying any data ?

(A) 4 (B) 3

(C) 2 (D) 1

SOLUTION

Tables for routing information

R_1	R_2	R_3
R_2 $3+2=5$	R_1 $2+3=5$	R_1 $4+9+3=16$
R_3 3	R_3 2	R_2 $4+1+7=12$
R_4 $3+2+7=12$	R_4 7	R_3 $4+9=13$
R_5 $3+9=12$	R_5 $7+1=8$	R_4 $4+1=5$
R_6 $3+9+4=16$	R_6 $7+1+4=12$	R_5 4

R_4	R_5	R_6
R_1 $7+2+3=12$	R_1 $9+3=12$	R_1 $4+9+3=16$
R_2 7	R_2 $1+7=8$	R_2 $4+1+7=12$
R_3 $7+2=9$	R_3 9	R_3 $4+9=13$
R_5 1	R_4 1	R_4 $4+1=5$
R_6 $1+4=5$	R_6 4	R_5 4

Edge $R_1 \rightarrow R_2 = 6$

& $R_4 \rightarrow R_6 = 8$

Are never used

Hence (C) is correct option.

Question. 48

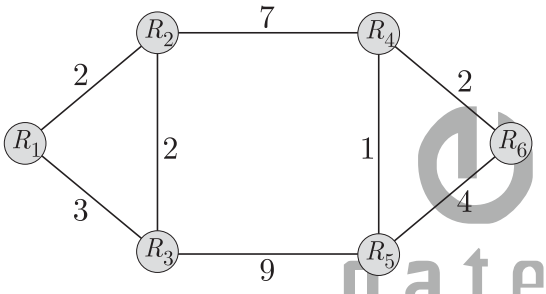
Suppose the weights of all unused links in the previous question are changed to 2 and the distance vector algorithm is used again until all routing tables stabilize. How many links will now remain unused ?

(A) 0 (B) 1

(C) 2 (D) 3

SOLUTION

Now the network becomes



Using same method.

R_1	R_2	R_3
R_2 2	R_1 2	R_1 3
R_3 3	R_3 2	R_2 2
R_4 $2+7=9$	R_4 7	R_4 $2+7=9$
R_5 $3+9=12$	R_5 $7+1=8$	R_5 9
R_6 $2+7+2=11$	R_6 $7+2=9$	R_6 $9+1+2=12$

R_4	R_5
R_5 1	R_6 $1+2=3$
R_6 2	

So $R_5 \rightarrow R_6 = 4$ is never used.

Hence (B) is correct option.

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