GATE SOLVED PAPER
Computer Science Engineering
Computer Network

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GATE SOLVED PAPER - CSE

COMPUTER NETWORK

Q. 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.

Q. 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

Q. 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

Q. 4   A 2 km long brodcast LAN has 10^7 bps bandwidth and uses CSMA/CD. The signal travels along the wire at 2×10^8 m/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

Q. 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) 7.69×10^6 bps   (B) 11.11×10^6 bps

(C) 12.33×10^6 bps   (D) 15.00×10^6 bps

Q. 6   Choose the best matching Group 1 and Group 2.

	Group-1		Group-2
P.	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

Q. 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.

Q. 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

Q. 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

Q. 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

Common Data For Q. 11 & 12

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).

| Network A | 1 Mbps | Network B | 512 kbps | Network C |

Q. 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

Q. 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

Q. 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

Q. 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

Q. 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}

Q. 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

Q. 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

YEAR 2005   **TWO MARKS**

Q. 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

Q. 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   (B) 416

(C) 464   (D) 512

YEAR 2006   **ONE MARK**

Q. 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

YEAR 2006   **TWO MARKS**

Q. 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

Q. 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 diff. network

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

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

Q. 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

Statement For Linked Answer Q. 24 and 25 :

Consider the diagram shown below where a number of LANs are connected by (transparent) bridges. In order to avoid packets looping through circuits in the graph, the bridges organize themselves in a spanning tree. First, the root bridge is identified as the bridge with the least serial number. Next, the root sends out (one or more) data units to enable the setting up of the spanning tree of shortest paths from the root bridge to each bridge. Each bridge identifies a port (the root port) through which it will forward frames to the root bridge. Port conflicts are always resolved in favour of the port with the lower index value. When there is a possibility of multiple bridges forwarding to the same LAN (but not through the root port), ties are broken as follows: bridges closest to the root get preference and between such bridges, the one with the lowest serial number is preferred.
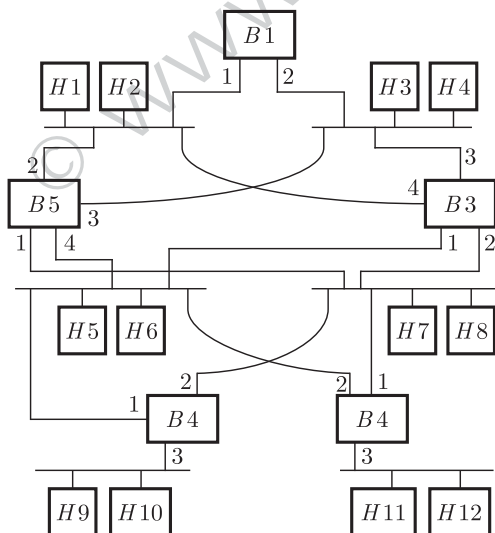
Q. 24   For the given connection of LANs by bridges, which one of the following choices represents the depth first traversal of the a panning tree of bridges?

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

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

Q. 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

Q. 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

Q. 27   Which one of the following uses UDP as the transport protocol?
(A) HTTP   (B) Telnet
(C) DNS   (D) SMTP

Q. 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) $1-(1-p)^{n-1}$

Q. 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

Q. 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

Q. 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

Q. 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) $\left\lceil \log_2 \dfrac{2LtR + 2K}{K} \right\rceil$ (B) $\left\lceil \log_2 \dfrac{2LtR}{K} \right\rceil$

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

Q. 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

YEAR 2008   **ONE MARK**

Q. 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

YEAR 2008   **TWO MARKS**

Q. 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

Q. 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

Q. 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

Q. 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

YEAR 2009   TWO MARKS

Q. 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

Q. 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

Q. 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

Statement For Linked Answer Q. 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).

Q. 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) $l = 5$

Q. 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

YEAR 2010   **ONE MARK**

Q. 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

Q. 45   Which one of the following is not a client-server application ?
(A) Internet chat   (B) Web browsing
(C) E-mail   (D) Ping

**YEAR 2010**   **TWO MARKS**

Q. 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

Statement For Linked Answer Q. 47 & 48 :

Consider a network with 6 routers R1 and R6 connected with links having weights as shown in the following diagram.
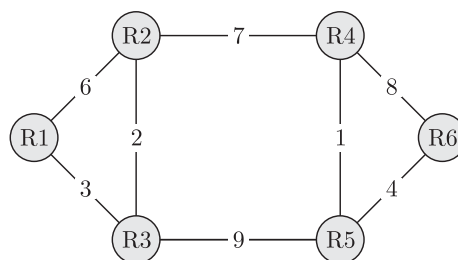
Q. 47   All the routers use the distance vector based routing algorithm to update their routing tables. Each starts with its routing table initialized to contain an entry for each neighbour with the weight of the respective connecting link. After all the routing tables stabilize, how many links in the network will never be used for carrying any data ?

(A) 4   (B) 3
(C) 2   (D) 1

Q. 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

**YEAR 2011**   ONE MARK

Q. 49   A layer-4 firewall (a device that can look at all protocol headers up to the transport layer) CANNOT

(A) block entire HTTP traffic during 9:00 pm and 5:00 am

(B) block all ICMP traffic

(C) stop incoming traffic from a specific IP address but allow outgoing traffic to the same IP address

(D) block TCP traffic from a specific user on a multi-user system during 9:00 pm and 5:00 am

Q. 50   Consider different activities related to email

$m1$: Send an email from a mail client to a mail server
$m2$: Download an email from mailbox server to a mail client
$m3$: Checking email in a web browser

(A) $m1$: HTTP $m2$: SMTP $m3$: POP   (B) $m1$: SMTP $m2$: FTP $m3$: HTTP
(C) $m1$: SMTP $m2$: FTP $m3$: HTTP   (D) $m1$: POP $m2$: SMTP $m3$: IMAP

YEAR 2011   TWO MARKS

Statement For Linked Answer Q. 51 and 52 :

Consider a network with five nodes, $N1$ to $N5$, as shown below.
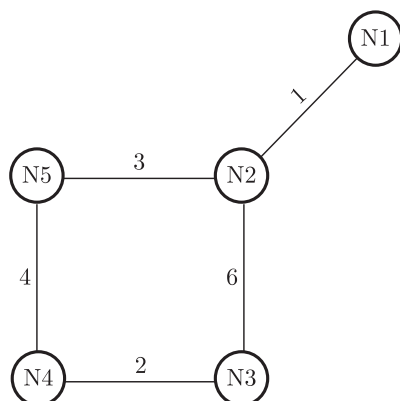
The network uses a Distance Vector Routing protocol. Once the routes have stabilized, the distance vectors at different nodes are as following.

$N1 : (0, 1, 7, 8, 4)$ $N2 : (1, 0, 6, 7, 3)$ $N3 : (7, 6, 0, 2, 6)$
$N4 : (8, 7, 2, 0, 4)$ $B5 : (4, 3, 6, 4, 0)$

Each distance vector is the distance of the best known path at that instance to nodes, $N1$ to $N5$, where the distance to itself is 0. Also, all links are symmetric and the cost is identical in both directions. In each round, all nodes exchange their distance vectors with their respective neighbors. Then all nodes update their distance vectors. In between two rounds, any change in cost of a link will cause the two incident nodes to change only that entry in their distance vectors.

Q. 51 The cost of link $N2 - N3$ reduces to 2(in both directons). After the next round of updates, what will be the new distance vector at node, $N3$?

(A) (3, 2, 0, 2, 5)   (B) (3, 2, 0, 2, 6)

(C) (7, 2, 0, 2, 5)   (D) (7, 2, 0, 2, 6)

Q. 52 After the update in the previous question, the link $N1 - N2$ goes down. $N2$ will reflect this change immediately in its distance vector as cost ∞. After the NEXT ROUND of update, what will be the cost to $N1$ in the distance vector of $N3$?

(A) 3   (B) 9

(C) 10   (D) ∞

Q. 53 The Protocol Data Unit (PDU) for the application layer in the Internet stack is
(A) Segment   (B) Datagram
(C) Message   (D) Frame

Q. 54 Which of the following transport layer protocols is used to support electronic mail?
(A) SMTP   (B) IP
(C) TCP   (D) UDP

Q. 55 In the IPv4 addressing format, the number of networks allowed under Class C addresses is
(A) 2^{14} (B) 2^7
(C) 2^{21} (D) 2^{24}

Q. 56 An Internet Service Provider (ISP) has the following chunk of CIDR-based IP addresses available with it : 254.248.128.0/20. The ISP wants to give half of this chunk of addresses to Organization A, and a quarter of Organization B, while retaining the remaining with itself. Which of the following is a valid allocation of addresses to A and B?

(A) 245.248.136../21 and   (B) 245.248.128.0/21 and
    245.248.128.0/22   245.248.128.0/22

(C) 245.248.132.0/22   (D) 245.248.136.0/24
    245.248.132.0/21   245.248.132.0/21

Q. 57   Consider a source computer (S) transmitting a file of size 10^6 bits to a destination computer (D) over a network of two routers (R_1 and R_2) and three links (L_1, L_2 and L_3). L_1 connects S to R_1; L_2 connects R_1 to R_2; and L_3 connects R_2 to D. Let each link be of length 100 km. Assume signals travel over each link at a speed of 10^8 meters per second. Assume that the link bandwidth on each link is 1 Mbps. Let the file be broken down into 1000 packets each of size 1000 bits. Find the total sum of transmission and propagation delays in transmitting the file from S to D?

(A) 1005 ms   (B) 1010 ms

(C) 3000 ms   (D) 3003 ms

Q. 58   Consider an instance of TCP's Additive Increase Multiplicative Decrease (AIMD) algorithm where the windows 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 time-out occurs during the fifth transmission. Find the congestion window size at the end of the tenth transmission.

(A) 8 MSS   (B) 14 MSS

(C) 7 MSS   (D) 12 MSS

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ANSWER KEY

Computer Network									
1	2	3	4	5	6	7	8	9	10
(D)	(D)	(D)	(C)	(B)	(A)	(B)	(A)	(B)	(A)
11	12	13	14	15	16	17	18	19	20
(D)	(B)	(B)	(D)	(B)	(B)	(D)	(D)	(D)	(B)
21	22	23	24	25	26	27	28	29	30
(B)	(C)	(C)	(A)	(A)	(B)	(C)	(A)	(C)	(C)
31	32	33	34	35	36	37	38	39	40
(B)	(C)	(B)	(B)	(D)	(C)	(B)	(C)	(B)	(B)
41	42	43	44	45	46	47	48	49	50
(C)	(D)	(B)	(D)	(D)	(D)	(C)	(B)	(A)	(C)
51	52	53	54	55	56	57	58		
(A)	(C)	(C)	(C)	(C)	(A)	(D)	(C)		