

1 Four devices are connected in a mesh topology. How many links/cables will be required?

A. 3

B. 4

C. 5

D. 6

$$\frac{n(n-1)}{2}$$

2 Session layer of the TCP/IP model is located at layer 2

A. 1

B. 2

C. 5

D. 6

3 At layer-2, a frame is defined as ...?

A. A set of bits between the special flag 01111110.

B. A set of time slots

C. All bits transmitted in a given time duration

D. Option A and C.

4 Which of the following are valid modulation techniques for transmissions over a digital channel?

A. Amplitude Shift Keying (ASK)

B. Frequency Shift Keying (FSK)

C. Phase Shift Keying (PSK)

D. None of the above.

5 A receiver sends an ACK packet with a sequence number that indicates.

A. The previous packet is missing

B. The next packet or byte expected by the receiver

C. The CRC or FCS value

D. None of the above.

6 A channel allows full duplex communications.

This means

A. The channel has no errors

B. The communication is only one way

C. Both the sender and receiver can transmit simultaneously

D. The sender must reply at a specific time.

7 After transmitting a packet, a sender will experience a timeout when ...?

A. A frame is missing

B. An acknowledgment is missing

C. After receiving an acknowledgment

D. Option A and B.

8 Which of the following is correct about layer-1 of the TCP/IP protocol stack?

A. It is responsible for routing

B. It uses IP addresses

C. It has a checksum to check for errors

D. It converts bits into waveforms.

9 At the physical layer, a waveform can be used to transmit ..

A. 1 bit

B. 2 bits

C. 3 bits

D. All of the above.

10 How is the sequence number in packets or frames used by a receiver?

A. To determine the next expected packet

B. To determine whether a packet is missing  
C. It is to calculate how many ACK packets to send

D. Option A and B.

11 advantage of recovering from packet loss

Using a What is the negative ACK as compared to a timeout?

A. A receiver can quickly inform the sender of a missing packet

B. A missing packet can be transmitted multiple times

C. A sender can send a larger packet

D. All of the above.

12 In Go-Back-N, the receiver window is used to ..?

A. Calculate the CRC of packets

B. Determine the next expected packet

C. Control the number of packets sent by a sender

D. None of the above.

13 Both Go-Back-N and Selective ARQ (repeat) use a received window. What is their difference?

A. There is no difference

B. Selective ARQ can have a larger received window than Go-Back-N

C. Selective ARQ receiver is able to accept out of order frames

D. Option B and C.

14 A transmitter is using 4-QAM. How many



bits are in each symbol?

- A. 1
- B. 2
- C. 4
- D. 8

☒

15 The Rivest-Shamir-Adleman (RSA) algorithm is used ..?

A. By two computers to derive a common key / password

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B. To compute a public-private key pair

C. To check the checksum or CRC of a frame

D. None of the above.

16 Let  $L$  be packet size in bits,  $R$  is the round trip time (seconds). How is throughput calculated?

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A.  $L/2R$

B.  $L/R$

C.  $R \times L$

D.  $L/(R/2)$

17 How does a receiver check whether a frame has errors?

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A. It sends an ACK to ask the sender

B. It first calculates the CRC of the frame and checks whether there is a remainder

C. It checks whether the frame length is correct

D. All of the above.

18 If the baud rate is 10 symbols per second, and each symbol encodes 5 bits. How many bits are transmitted over 10 seconds?

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- A. 5
- B. 50
- C. 10
- D. 500

19 A sender is using Manchester encoding to transmit bit

How does a receiver synchronize its clock?

A. By flipping the waveform, i.e., a positive value becomes negative and vice-versa

B. By using transition at the middle of each bit

C. By recording the start time and end time of a bit

D. None of the above.

20 When computing the CRC or FCS of a frame, the following step

$X(X + X + 1)$  does what?

A. Enables the generator polynomial to detect more errors

B. Change bits from ones to zeroes, e.g., 110 becomes 001

C. Does nothing. It's redundant

D. None of the above.

A 21 Consider a Linear Feedback Shift Register (LFSR) constructed for the divisor (or  $G$ )  $X^2 + X + 1$ . How do you determine the number of flip-flops or registers required to construct the LFSR?

A. By looking at the term with the highest exponent, i.e.,  $X^2$

- B. By adding +1 to the smallest term, i.e.,  $1+1$
- C. By counting the total number of terms and subtract one
- D. By multiplying it with  $X$ .

22 Consider the case whereby each channel has only one user ~~which of~~ the following is true?

- A. The user must run a channel access protocol
- B. The user can transmit whenever it wants
- C. The user must always back off before each transmission
- D. None of the above.

23 A sender and a receiver are using a Hamming code. Which of the following can be used to check for errors?

- A. Syndrome
- B. H matrix
- C. ACK
- D. Option A and B

24 Compared to Go-Back-1, Go-Back-10 has a higher throughput on a 10Mbps channel. Why?

- A. It can send ten ACKs at a time
- B. It does not experience any errors
- C. Each packet has a lower transmission time
- D. It is able to send multiple frames at a time.

25 Which of the following IP address is wrong?

- A. 130.130.10.1



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B. 60.130.1.1

C. 0.0.0.0

D. None of the above.

26 Consider the following subnet 130.130.10.1/

31. Which option is correct?

A. There are exactly two subnets

B. There are exactly two addresses in the

subnet

C. There are 16 addresses in the subnet

D. All machines on the subnet are reachable

via port number 31.

27 Consider the following address block: 10.13.1.1

/20. Calculate the number of addresses it has?

A. 232

B. 210

C. 220

D. 232-20.

How do you

28 A network requires 100 subnets. How many bits are required to identify each subnet?

A. 2

B. 4

C. 7

D. 10.

29 Given www.baidu.com, which protocol can be used to obtain its IP address?

A. HDLC

B. DHCP

C. DNS

D. ARP.

30 Upon encountering a timeout, what does a TCP sender set its congestion window (cwnd) to?

A. 1

B. 2

C. 3

D. 4

31 Assuming a TCP sender's congestion window (cwnd) is currently at 8. It receives an acknowledgment and it is in the slow start phase. (ACK). How is cwnd updated?

A.  $cwnd = cwnd \times 1$

B.  $cwnd = cwnd + 1$

C.  $cwnd = cwnd - 1$

D.  $cwnd = cwnd$

32 A user noticed the following IPv6 address ::132.10.10.10. How many bits does it have?

A. 32

B. 64

C. 128

D. None of the above.

33 Which of the following method can be used to show that a user knows a secret?

A. Ask the user to encrypt a number using the secret, and check whether it is the same number after decryption

B. Ask the user to compute a hash of a number with the secret, and check whether the hash is correct

C. Ask the user to run the Diffie-Hellman algorithm



D. Option A and B.

34 User Bob has encrypted a message with Alice's public key. key does Alice need to use in order to decrypt the message?

A. Her private key

B. Bob's public key

C. Bob's symmetric key

D. Her public key

What

35 Assume Bob knows Alice's public key. He received a message from someone who claims to be Alice. How can Bob check he is communicating with Alice?

A. He asks the person to reveal Alice's private key

B. He sends a number to the person and ask him/her to encrypt it using Alice's private key, decrypts it using Alice's public key, and checks whether it is the same number

C. He encrypts a number using Alice's public key and ask the person to reveal the number

D. Option B and C.

## 大题 1

根据下表画图补线：

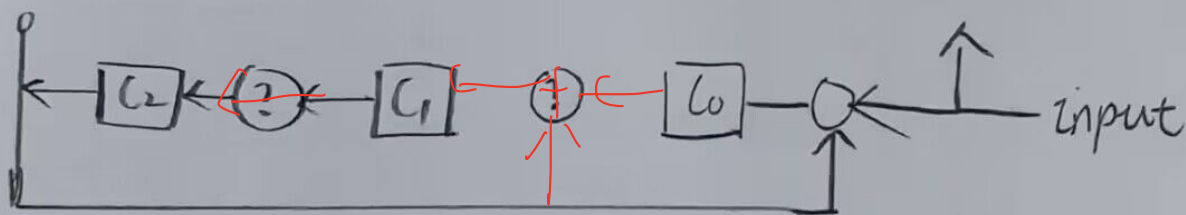
$C_2$	$C_1$	$C_0$	$I = \text{Input}$
0	0	0	
0	0	1	1
0	1	1	1
1	1	1	1
1	0	0	1
0	1	0	1

$$C_2 = C_1'$$

$$C_0 = C_2' \oplus I$$

$$C_1 = C_2' \oplus C_0'$$

下图补线、补异或门



## 大题 2

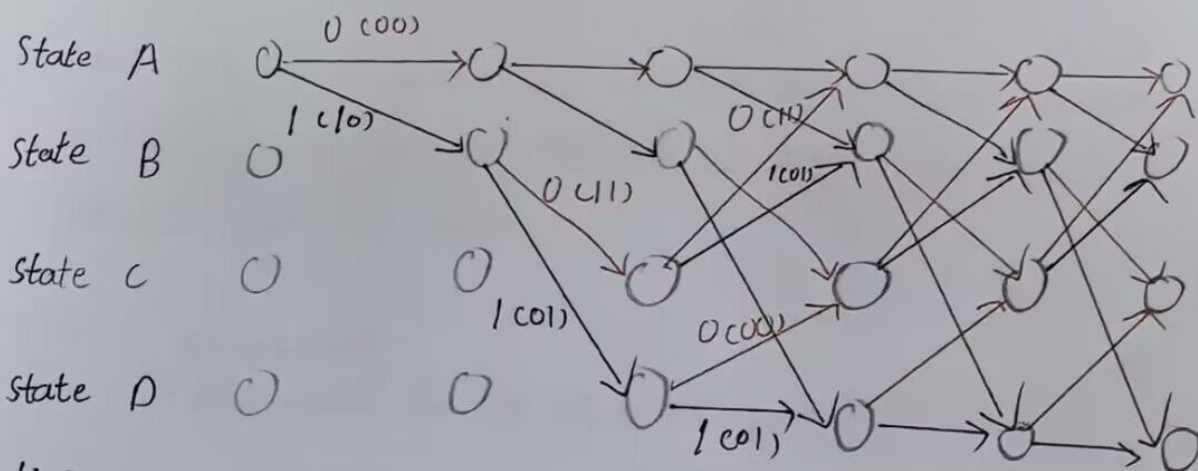
第一问：Node-A has four (4) packets for Node-B and both node use Go-Back-N with  $N=4$ . Assume Frame-1 is missing

(翻译成人话，就是 frame-1 丢了，让你画个 Go-Back-4 的图)

注意标记：packets, sender, receive window, timeout

第二问：还是上面那个情况，然后画 Selective ARQ (repeat)

### 大题 3



(好了, 上面是题干, 不要你画图, 你要填的是下面这个):

State	Value (s <sub>2</sub> , s <sub>1</sub> )
A	(00)
B	(01)
C	(10)
D	(11)

这其实是要你填的空  
但我们讨论后, 这是正解

### 大题 4

The following questions relate to TCP

(i) A sender increases its congestion window as:  
 $cwnd = cwnd + 1$

要你判断, 这是在 slow start 状态 还是 congestion avoidance?

答: slow start.

(ii) What are two signals that indicate there is congestion?



ciii) What is the purpose of the threshold value?

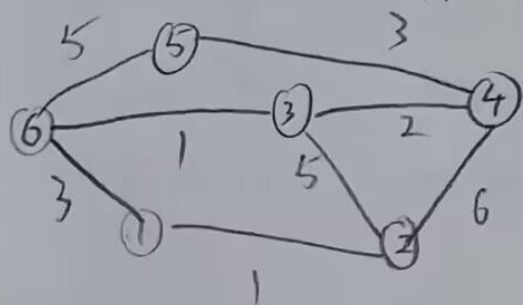
civ) Assume a sender has a cwnd value of 10. It receives an ACK with receive window of zero. How many packets can it send?

cv) a sender

何时 cwnd 能够增至 13 (当之前有 12 个 packets)?

(vi) Why does a sender reduce its cwnd by half instead of setting cwnd to 1, when it receives 3 duplicated ACKs?

大题 5: Dijkstra's 算法



(a) 上图, 补表

(assume all link cost is 1)

(b)

已知:

Dest	Cost	Next-Hop
Net 2	2	B
Net 3	3	B
Net 4	4	B

已知:

Net 2	2
Net 3	3
Net 4	4

然后填下方的表：

Dest	Cost	Next-Hop
Net 2		
Net 3		
Net 4		

大题 6

ci) 010101

画 NRZ

画 NRZ-I

cii) If an IP address 13.13.16.220 (11011100) arrives.

下面哪个符合

答：我记得正解，其余不记得了

Network ID	Netmask	序号
13.13.16.0	255.255.255.0	2

答案问序号，因此是 2

