

2017-2018-2

**Part One : Multiple Choice (每题 1 分, 共 20 分)**

A-B-A-C-A  
B-A-C-B-C  
A-D-D-C-D  
D-D-A-C-D

**Part Two : Fill-in-the-blank (每空 1 分, 共 15 分)**

1. SMTP
2. DHCP
3. DNS
4. P2P/Peer-to-peer
5. Go-Back-N (GBN)
6. Routing Information Protocol, Open Shortest Path First (前后顺序可替换)
7. ICMP
8. Router
9. Switch/Switcher
10. Carrier Sense Multiple Access (CSMA)
11. Packet switching
12. User Datagram Protocol (UDP)
13. Transmission delay, propagation delay (前后顺序可替换)

**Part Three: Answer the following question briefly (每题 7 分, 共 35 分)**

1. The five layers in the Internet protocol stack are – from top to bottom – the application layer, the transport layer, the network layer, the link layer, and the physical layer.

Application layer: exchange information message of network application in another end system;

Transport layer: transport application-layer messages between application endpoints as segments;

Network layer: deliver datagrams from one hosts to another;

Link layer: deliver the packet from one node (host or router) to the next node in the route;

Physical layer: move the individual bits within the frame from one node to the next node in the route.

评分标准：5 个层名共 2 分，每 1 层的服务各 1 分。

2. 评分标准：答案不惟一，每格 0.5 分

Application-layer Protocol	Transport-layer Protocol	Transport-layer Port
HTTP	TCP	80
FTP	TCP	21/20
Telnet	TCP	23
SMTP	TCP	25
RIP	UDP	520

3. ARP query and response packet both have four fields, i.e., sending and receiving IP and MAC addresses.

- 1) The adapter of A sends an ARP query packet with broadcast address FF-FF-FF-FF-FF-FF as destination MAC address;
- 2) Each adapter passes the ARP packet within the frame up to its ARP module to check if its IP address matches the destination IP address.
- 3) B sends back a response ARP packet in the unicast manner, including its IP address and corresponding MAC address.

评分标准：相关字段 1 分；每个协议要点 2 分。

4.

- 1) channel partitioning protocols: Time-division multiplexing (TDM), frequency-division multiplexing (FDM)
- 2) random access protocols: ALOHA, carrier sense multiple access (CSMA)
- 3) taking-turns protocols: Polling protocol, token-passing protocol.

评分标准：协议类别和技术错一个扣 1 分，各类别技术的答案不惟一。

5.

- 1) DHCP server discovery: a newly arriving host sends DHCP discover message within a UDP packet to port 67, broadcast destination IP address of 255.255.255.255, source IP address of 0.0.0.0.
- 2) DHCP server offer(s): A DHCP server responds to the client with a DHCP offer message that is broadcast to all nodes on the subnets, contains the proposed IP address for the client, the network mask, and the IP address lease time.
- 3) DHCP request: The client will choose from among one or more servers and respond with a DHCP request message echoing back the configuration parameters.

4) DHCP ACK: The server responds to the client with a DHCP ACK message, confirming the requested parameters.

评分标准：前面两步各 2 分，后面两步各 1.5 分。

#### Part Four: Analysis and computing （每题 10 分，共 30 分）

1. 答案不唯一（10 分，每错一格扣 0.5 分）

Step	$N'$	$D(t),p(t)$	$D(u),p(u)$	$D(v),p(v)$	$D(w),p(w)$	$D(y),p(y)$	$D(z),p(z)$
0	x	$\infty$	$\infty$	<b>3,x</b>	6,x	6,x	8,x
1	xv	7,v	<b>6,v</b>	3,x	6,x	6,x	8,x
2	xvu	7,v	6,v	3,x	<b>6,x</b>	6,x	8,x
3	xvuwx	7,v	6,v	3,x	6,x	<b>6,x</b>	8,x
4	xvuwxy	<b>7,v</b>	6,v	3,x	6,x	6,x	8,x
5	xvuwyzt	7,v	6,v	3,x	6,x	6,x	<b>8,x</b>
6	xvuwyztz	7,v	6,v	3,x	6,x	6,x	8,x

2. 共 10 分

- TCP slowstart is operating in the intervals [1,6] and [23,26] （答对2个得1分，一个得0.5分）
- TCP congestion avoidance is operating in the intervals [6,16] and [17,22] （答对2个得1分，一个得0.5分）
- After the 16<sup>th</sup> transmission round, packet loss is recognized by a triple duplicate ACK. If there was a timeout, the congestion window size would have dropped to 1. （1分）
- After the 22<sup>nd</sup> transmission round, segment loss is detected due to timeout, and hence the congestion window size is set to 1. （1分）
- The threshold is initially 32, since it is at this window size that slow start stops and congestion avoidance begins. （1分）
- The threshold is set to half the value of the congestion window when packet loss is detected. When loss is detected during transmission round 16, the congestion windows size is 42. Hence the threshold is 21 during the 18<sup>th</sup> transmission round. （1分）
- The threshold is set to half the value of the congestion window when packet loss is detected. When loss is detected during transmission round 22, the congestion windows size is 29. Hence the threshold is 14 (taking lower floor of 14.5) during the 24<sup>th</sup> transmission round. （1分）
- During the 1<sup>st</sup> transmission round, packet 1 is sent; packet 2-3 are sent in the 2<sup>nd</sup> transmission round; packets 4-7 are sent in the 3<sup>rd</sup> transmission round; packets 8-15

are sent in the 4<sup>th</sup> transmission round; packets 16-31 are sent in the 5<sup>th</sup> transmission round; packets 32-63 are sent in the 6<sup>th</sup> transmission round; packets 64 – 96 are sent in the 7<sup>th</sup> transmission round. Thus packet 70 is sent in the 7<sup>th</sup> transmission round.  
(3分)

3. 本题 10 分

a) 除 otherwise，每行得 1 分

Prefix Match	Link Interface
11100000 00	0
11100000 01000000	1
1110000	2
11100001 1	3
otherwise	3

b) 每小问 2 分，共 6 分

Prefix match for first address is 5<sup>th</sup> entry: link interface 3 (2 分)

Prefix match for second address is 3<sup>rd</sup> entry: link interface 2 (2 分)

Prefix match for third address is 4<sup>th</sup> entry: link interface 3 (2 分)