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东 北 大 学 考 试 试 卷 （ B 卷 ）

2009 —2010 学 年 第 一 学 期

课程名称：计算机网络（Computer Networks）

总分	一	二	三	四	五		



I . Multiple Choice （20 points, 1 point for each）

Directions: Choose the correct answer for each question and fill it in the corresponding blank. There is ONLY ONE correct answer for each question.

- (        )1. There are two kinds of coaxial cables usually used. One is the baseband cable and the other is the broadband cable. The impedance of the broadband cable is:  
A. 50Ω    B. 70Ω    **C. 75Ω**    D. 90Ω
- (        )2. According to the ISO/OSI reference model, the router works on:  
A. Data link layer    **B. Network layer**    C. Transport layer    D. Presentation layer
- (        )3. Which device extends the LAN on data link layer?  
A. Repeater    B. Hub    **C. Switch**    D. Router
- (        )4. The communication method which can transmit data bi-directionally on the same channel at the same time is called:  
A. simplex    B. half duplex    **C. full duplex**    D. none of the above
- (        )5. 10Base5 network takes:  
A. thick coaxial cable, star topology    **B. thick coaxial cable, bus topology**  
C. thin coaxial cable, star topology    D. thin coaxial cable, bus topology
- (        )6. When two computers communicate via a LAN, which of the following device is necessary?  
**A. network adapter**    B. MODEM    C. repeater    D. coaxial cable
- (        )7. If a package is to be broadcasted to the local network, then the destination IP address of the package should be:  
**A. 255.255.255.255**    B. 0.0.0.0  
C. the lowest address of the subnet    D. the highest address of the subnet
- (        )8. What many bytes are there in the payload of an ATM cell?  
**A. 48**    B. 53    C. 64    D. 36
- (        )9. The core of the Internet protocols is:

- (        )10. With respect to protocol layer, the RARP protocol in TCP/IP corresponds to:  
A. physical layer    **B. data link layer**    C. network layer    D. transport layer
- (        )11. The lower layer of RIP protocol uses:  
**A. UDP**    B. TCP    C. ARP    D. IP
- (        )12. Which port on sever does the SMTP protocol use?  
A. 20    B. 23    C. 25    **D. 110**
- (        )13. What is the mask for a smallest subnet usable in practice?  
A. 255.255.255.0    B. 255.255.255.254    **C. 255.255.255.252**    D. 255.255.255.255
- (        )14. Which of the following is true of the IP address 198.0.0.10 using default mask?  
A. The netid is 198.    B. The hostid is 0.10.  
**C. The network address is 198.0.0.0**    D. The hostid is 0.0.10
- (        )15. When connecting computers via twisted pairs, the interface standard we take is:  
A. X.25    B. RJ11    C. RS232    **D. RJ45**
- (        )16. Which of the following is true about IP routing?  
A. The destination IP address changes at each hop.  
B. The source IP address changes at each hop.  
C. The frame does not change at each hop.  
**D. The frame changes at each hop.**
- (        )17. Which of the following ranges is considered as well-known port number?  
**A. 1~1023**    B. 1024 and above    C. 1~256    D. 1~65534
- (        )18. Which of the following services is used to translate a web address (URL) into an IP address?  
**A. DNS**    B. HTTP    C. DHCP    D. Telnet
- (        )19. The Internet can be traced back to its origin:  
**A. ARPANET**    B. ALOHA    C. NEFNET    D. Ethernet
- (        )20. Which of the following IPv6 addresses is correct?  
A. 2001:::8::417A    B. 12.20.3.3:0:0:0:0:FFFF    **C. ::145.20.15.29**    D.

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II. Fill in the blanks （10 points, 1 point for each blank）  
Directions: Fill proper contents into the blanks according to the context.

1. The length of an IPv4 header is 40 bytes.
2. The ISO/OSI protocol consists of 7 (how many) layers.
3. ping 127.0.0.1 command will test the internal loopback of a computer. (fill the complete command)
4. 65534 (how many) usable subnets are created by applying the subnet mask 255.255.255.0 to a Class A network.
5. FF-FF-FF-FF-FF-FF is a Layer-2 broadcast address.
6. In Internet, we use IP address and port number as the identification of a process.
7. The common used guided transmission media are coaxial cable, twisted pair, and optical fiber.

III. True or False （10 points, 1 point for each）  
Directions: Answer the following using True/False. You do not need to explain your answers.

- ( T ) 1. During connection establishment, each party uses a random number generator to create an initial sequence number.
- ( F ) 2. At high load efficiency of an ALOHA channel is high.
- ( F ) 3. The hubs can interconnect a token-ring network and an Ethernet.
- ( F ) 4. 8 broadcast domains are created when you segment a network with an 8-port switch.
- ( T ) 5. Packet-switching networks place a tight upper limit on block size.
- ( T ) 6. Network Address Translation technology is a solution to expand the number of IP addresses available for public use.
- ( T ) 7. Latency through the store-and-forward switch varies with frame length.
- ( T ) 8. Encryption and decryption are functions of the presentation layer.
- ( T ) 9. OSPF is an intra-AS routing protocol, while BGP is an inter-AS routing protocol.
- ( T ) 10. In Time-Division Multiplexing, each user can get all of the bandwidth periodically during its slot.

IV. Fill in the Forms （20 points）  
Directions: Fill proper contents into the forms.

1. Make a comparison among the three network interconnection devices: hubs, routers and switches. Fill in “Yes” or “NO” in the blanks of the following form to say whether the device can perform the corresponding function. (6 points)

	Hubs	Routers	Switches
Traffic Isolation	No	Yes	Yes
Plug & Play	Yes	No	Yes
Optimal Routing	No	Yes	No
Cut Through	Yes	No	Yes

2. Consider the TCP/IP protocol suite:
- (1) Fill the names of protocol data units corresponding to each layer in the PDU column. (4 points)
- (2) Match the following functions to one of the five layers in the Function column. (10 points)
- ①Reliable process-to-process message delivery
  - ②Packet switching
  - ③Defines frames
  - ④Provides user services such as email and file transfer
  - ⑤Transmission of bit stream across physical medium
  - ⑥Mechanical, electronical, and functional interface
  - ⑦Reassembly of data packets
  - ⑧Ensure reliable transmission of data
  - ⑨Network selection
  - ⑩Route determination

Layer	PDU	Functions
Application Layer	Message	④
Transport Layer	Segment	①
Network Layer	Packet	②⑦⑨⑩
Data Link Layer	Frame	③⑧
Physical Layer	Bits on the wire	⑤⑥

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V. Comprehensive Calculation (40 points)

1. (5 points) How long does it take to send a file of 640K bits from host A to host B over a circuit-switched network?

- All links are 1.536 Mbps
- Each link uses FDM with 24 channels
- 500 milliseconds to establish end-to-end circuit

Solution:

Transmission Speed:  $1.536\text{Mbps} \div 24 = 64\text{Kbps}$

Transmission Time:  $640\text{K} \div 64\text{Kbps} = 10\text{s}$

Connection Establishment Time: 0.5s

File sending time: 10.5s

2. (5 points) The distance between host A and host B is  $L = 10000\text{Km}$ . The bandwidth of the link is  $R = 1\text{Mbps}$  ( $2^{20}\text{bps}$ ). Suppose the propagation speed over this link is  $V = 2.5 \times 10^8\text{m/s}$ .

- (1) What is the propagation time  $T_p$ ?
- (2) During this time, how many bits have been sent to the link by host A?
- (3) What is the distance  $d$  between two adjacent bits?

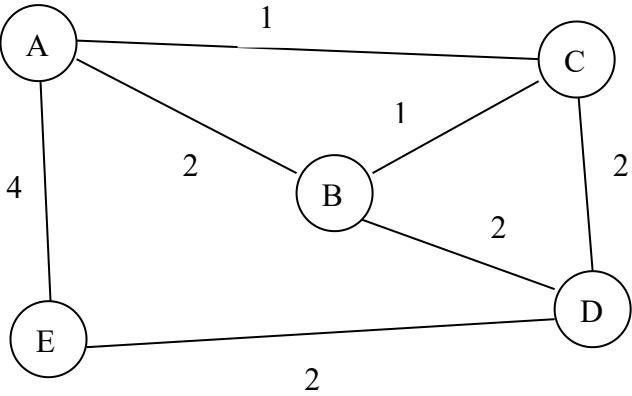
Solution:

$T_p = L \div V = 0.04\text{s}$

$\text{Numb} = T_p \times R = 41943$

$d = L \div \text{Numb} = 238\text{m}$

3. (6 points) Use Dijkstra Algorithm to find out the shortest paths from origin E to every other node in the following graph, and calculate corresponding costs.



Solution:

$E \rightarrow A$ :  $E \rightarrow A$ ,  $\text{cost}(E,A) = 4$

$E \rightarrow B$ :  $E \rightarrow D \rightarrow B$ ,  $\text{cost}(E,B) = 4$

$E \rightarrow C$ :  $E \rightarrow D \rightarrow C$ ,  $\text{cost}(E,C) = 4$

$E \rightarrow D$ :  $E \rightarrow D$ ,  $\text{cost}(E,D) = 2$

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4 . (9 points) An organization is granted an IP address 211.17.180.0. The network administrator wants to create 32 subnets.  
(1) Find out the subnet mask.  
(2) Find out the number of host addresses in each subnet.  
(3) Find out the network address of the second subnet.  
(4) Find out the first and last host addresses in the second subnet.  
(5) Find out the subnet directed broadcast address and limited broadcast address in the second subnet.

**Solution:**  
  
(1) 255.255.255.252  
(2) 2  
(3) 217.17.180.8  
(4) 217.17.180.9                      217.17.180.10  
(5) 211.17.180.11                      255.255.255.255

5. (15 points) Consider a router with the following routing table:

Destination Address	Subnet Mask	Next Hop
61.45.78.35		Interface 0
61.45.78.32	255.255.255.224	Interface 1
63.56.7.0	255.255.255.128	R2
65.45.34.0	255.255.255.224	R3
Default		R4

This router can forward packets directly through Interface 0 and Interface 1, and it can also forward packets through neighboring routers R2, R3, or R4. Suppose the router received 5 packets with the following IP addresses respectively:  
(1) 63.56.7.91                      (2) 64.45.34.44                      (3) 61.45.78.58  
(4) 63.56.7.191                      (5) 61.45.78.35  
Try to calculate the next hop of each packet.

**Solution:**  
  
(1) The result of 63.56.7.91 AND 255.255.255.128 is 63.56.7.0, so Packet 1 is forwarded to R2. (3 points)  
(2) The result of 64.45.34.44 AND MASK cannot match any entry, so Packet 2 is forwarded to R4. (3 points)  
(3) The result of 61.45.78.58 AND 255.255.255.224 is 61.45.78.32, so Packet 3 is forwarded to Interface 1. (3 points)  
(4) The result of 63.56.7.191 AND MASK cannot match any entry, so Packet 4 is forwarded to R4. (3 points)  
(5) 61.45.78.35 has the single IP entry, so Packet 5 is forwarded to Interface 0. (3 points)