1. **Definition（Each definition worth 5 marks，20 marks total）**

Web Page

A web page(also called a document) consists of objects. An object is simply a file-such as an HTML file, a JPEG image, a Java applet, or a video clip-that is addressable by a single URL.(P126)

广播链路 can have multiple sending and receiving nodes all connected to the same ,single,shared broadcast channel

套接字Socket is an identifier for a particular service on a particular node on a network. The socket consists of a node address and a port number, which identifies the service.

子网掩码 Subnet mask is a 32 bit address that is used to shield part of the IP address to distinguish between network identities and host identities, and to indicate whether the IP address is on a LAN or on a remote network.

路由 the network layer must determine the route or path taken by packets as they flow a sender to a receiver.

转发 when a packet arrives at a router’s input link, the router must move the packet to the appropriate output link.

协议 a protocol defines the format and the order of messages exchanged between two or more communication entities,as well as the actions taken on the transmission and/or receipt of a message or other event

网络缓存A web cache - also called a proxy server - is a network entity that satisfies HTTP requests on the behalf of an origin Web server. The web cache has its own disk storage and keeps copies of recently requested objects in this storage.(P138)

UDP is a no-frills,lightweight transport protocol,providing minimal services.UDP is connectionless, so there is no handshaking before the two processes start to communicate.

TCP service model includes a connection-oriented service and reliable data transfer services. Also includes a congestion-control mechanism.

1. **Term Interpretation（Each definition worth 1 marks，6 marks total）**

CSMA/CD CIDR MAC

CSMA/CD: carrier sense multiple access with collision detection (P490)

PDC:Primary Domain Controller

ADM:Asynchronous transfer mode

TDM:time division multiplexing

CRC:Cyclic Redundancy Check

ARQ:Automatic Repeat-reQuest

ARP:Address Resolution Protocol

FTP: file transfer protocol

PPP: point to point protocol

IP: internet protocol

P2P: Peer to peer

EDC: error detection and correct bits

CMDA:code division multiple access

UDP:User Datagram Protocol

FDM: frequency division multiplexing

MAC:medium access control

DNS: domain name system

CIDR:classless inter-domain routing

MAC:media access control

1. **Translation 翻译（英译汉/汉译英）（Each definition worth 10 marks，20 marks total）**
2. Thus our bit，when traveling from source to destination，passes through a series of transmitter-receiver pairs.For each transmitter-receiver pair,the bit is sent by propagating electromagnetic waves or optical pulses across a physical medium.The physical medium can take many shapes and forms and does not have to be of the same type for each transmitter-receiver pair along the path.Examples of physical media include twisted-pair copper wire,coaxial cable,multimode fiber-optic cable,terrestrial radio spectrum,and satellite radio spectrum.Physical media fall into two categories:guided media and satellite radio spectrum.Physical media fall into two categories:guided media and unguided media

因此，这个比特当从源到目的地传输时，通过一系列的"传输器-接收器"对。对于每个传输器-接收器对，通过跨越一种物理媒体传播电磁波或光脉冲来发送该比特。该物理媒体可以具有多种形状和形式，并且对沿途的每个传输器-接收器对而言不必具有相同的类型。物理媒体的例子包括双绞线、同轴电缆、多模光纤缆、陆地无线电频谱和卫星无线电频谱。物理媒介划分为两类：导引型媒体和非导引型媒体。

1. **short Answer question 简答题（Each definition worth 6 marks，24 marks total）**
2. What is the five layer internet protocol stack?

Application layer

Transport layer

Network layer

Link layer

Physical layer

1. What is the hierachy of DNS servers?

There are three classes of DNS server- root DNS servers, top-level domain DNS servers,and authoritative DNS servers(P162)

1. MAC（Media Access Control或者Medium Access Control）地址，意译为媒体访问控制，或称为物理地址、硬件地址，用来定义网络设备的位置。在OSI模型中，第三层网络层负责 IP地址，第二层数据链路层则负责 MAC地址。因此一个主机会有一个MAC地址，而每个网络位置会有一个专属于它的IP地址。 [1]

MAC地址是网卡决定的，是固定的。

1. CSMA/CD（Carrier Sense Multiple Access with Collision Detection）基带冲突检测的载波监听多路访问技术(载波监听多点接入/碰撞检测)。在传统的共享[以太网](https://baike.baidu.com/item/%E4%BB%A5%E5%A4%AA%E7%BD%91/99684" \t "https://baike.baidu.com/item/CSMA/CD/_blank)中，所有的节点共享[传输介质](https://baike.baidu.com/item/%E4%BC%A0%E8%BE%93%E4%BB%8B%E8%B4%A8/5538029" \t "https://baike.baidu.com/item/CSMA/CD/_blank)。如何保证传输介质有序、高效地为许多[节点](https://baike.baidu.com/item/%E8%8A%82%E7%82%B9/865052" \t "https://baike.baidu.com/item/CSMA/CD/_blank)[提供](https://baike.baidu.com/item/%E6%8F%90%E4%BE%9B/2290673" \t "https://baike.baidu.com/item/CSMA/CD/_blank)传输[服务](https://baike.baidu.com/item/%E6%9C%8D%E5%8A%A1/85523" \t "https://baike.baidu.com/item/CSMA/CD/_blank)，就是以太网的[介质访问控制](https://baike.baidu.com/item/%E4%BB%8B%E8%B4%A8%E8%AE%BF%E9%97%AE%E6%8E%A7%E5%88%B6/10081534" \t "https://baike.baidu.com/item/CSMA/CD/_blank)协议要解决的问题。
2. TCP与UDP区别

TCP提供的是面向连接的、可靠的数据流传输；

UDP提供的是非面向连接的、不可靠的数据流传输。

TCP提供可靠的服务，通过TCP连接传送的数据，无差错、不丢失，不重复，按序到达；UDP尽最大努力交付，即不保证可靠交付。

TCP面向字节流；

UDP面向报文。

TCP连接只能是点到点的；

UDP支持一对一、一对多、多对一和多对多的交互通信。

TCP首部开销20字节；

UDP的首部开销小，只有8个字节。

TCP的逻辑通信信道是全双工的可靠信道；

UDP的逻辑通信信道是不可靠信道。

TCP定义

TCP（Transmission Control Protocol 传输控制协议）是一种面向连接的、可靠的、基于字节流的传输层通信协议，由IETF的RFC 793定义。

UDP定义

UDP （User Datagram Protocol 用户数据报协议）是OSI（Open System Interconnection开放式系统互联） 参考模型中一种无连接的传输层协议，提供面向事务的简单不可靠信息传送服务。

1. IP地址和MAC地址不同的特点主要有：

1.对于网络上的某一设备，如一台计算机或一台路由器，其IP地址可变（但必须唯一），而MAC地址不可变。我们可以根据需要给一台主机指定任意的IP地址，如我们可以给局域网上的某台计算机分配IP地址为192.168.0.112 ，也可以将它改成192.168.0.200。而任一网络设备（如网卡，路由器）一旦生产出来以后，其MAC地址永远唯一且不能由用户改变。

2. 长度不同。IP地址为32位，MAC地址为48位。

3. 分配依据不同。IP地址的分配是基于网络拓朴，MAC地址的分配是基于制造商。

4. 寻址协议层不同。IP地址应用于OSI第三层，即网络层，而MAC地址应用在OSI第二层，即数据链路层。 数据链路层协议可以使数据从一个节点传递到相同链路的另一个节点上（通过MAC地址），而网络层协议使数据可以从一个网络传递到另一个网络上（ARP根据目的IP地址，找到中间节点的MAC地址，通过中间节点传送，从而最终到达目的网络）。

（7） 物理层、链路层、网络层扩充设备 特点

OSI7层模型里的物理层，是七层中的最下一层，从字面上就可以看出解释是物理硬件方面的。例如一个网卡如果损坏，那物理层就出问题，不用说其他层了，数据自然就被阻断在物理层。

数据链层不是一个设备，正规来说是分层两层的，一种是逻辑链接控制子层，一种是媒体访问控制子层。个人建议你没必要了解这么深，你只要知道MAC地址是工作在数据链路层的就行了。

简单的理解如下：

物理层：硬件

链路层：MAC

网络层：IP地址，路由功能

所谓的2层交换机，就是只识别MAC地址。（傻瓜交换机就是2层交换机）。还有一种概念，是2层可管理交换机（这种不是傻瓜交换机，但是带有管理功能）。所谓的3层交换机就是可以识别IP地址，并带有路由功能。

网络层关键的设备：三层交换机，路由器。

1. **Computation计算题（the question worth 10，30 marks total）**

( 1)Suppose we want to transmit the message11001 and CRC is adopted for error detect the Polynomial generator is P(x)=X^3+1

1. Use polynomial long division to determine the message that should be transmitted.
2. Suppose the leftmost bit of the message is inverted due to noise on the transmission link.What is the result of the receiver’s CRC calculation?How does the receiver know that an error has occurred?

（a）使用多项式长除法来确定应传输的消息。<https://blog.csdn.net/d_leo/article/details/73572373>

P(x)=X^3+1 = 1001

4-1=3

11001000/1001 = 11001010

（b）假设由于传输链路上的干扰，消息的最左边的那位被反转。接收器的CRC计算结果是什么？接收器如何知道发生了错误？

https://zhidao.baidu.com/question/140810640.html

1. **suppose a router has built up the routing table shown in Table-1.The router can deliver packets directly over interface-0 and interface-1,or it can forward packets to router R2,R3,or R4.Assume the route does the longest prefix match.Describe what the router does with a packet addressed to each of the following destinations:**

(a)128.96.171.92

(b)128.96.167.151

Table-1

|  |  |  |
| --- | --- | --- |
| SubnetNumber | SubnetMask | NextHop |
| 128.96.170.0 | 255.255.254.0 | Interface-0 |
| 128.96.168.0 | 255.255.254.0 | Interface-1 |
| 128.96.166.0 | 255.255.254.0 | R2 |
| 128.96.164.0 | 255.255.252.0 | R3 |
| Default |  | R4 |

1. 第一个：

255.255.254.0 == 11111111.11111111.11111110.0

128.96.171.92 == 128 . 96 .10101011.92

按位与： 128 . 96 .10101010.0 ==128.96.170.0

结果： 128.96.170.0 == 128.96.170.0 nexthop为 interface-0

继续判断是否有相同结果的，若有则选择subnetmask 大的那个

1. 128.96.167.121

解答同（a）

(3)Suppose Host A wants to sent a large file to Host B.The path from Host A to Host B has three links,of rates R1=400kbps,R2=3Mkbps,R3=2Mbps,

1. Assuming no other traffic in the network,what is the throughput for the file transfer
2. Suppose the file is 2 million bytes,Roughly,how long will it take to transfer the file to Host B?
3. Repeat(a) and (b),but now with R2 reduced to 200kbps

(3)

a.400Kbps

b.2×106×8/(400×1000bps)=40s

c.200kbps 2×106×8/(200×1000bps)=80s

1. **Table-1 is the routing table using CIDR.Address bytes are in hexadecimal.The notation”/23” in C4.5E.2.0 means a netmask with 23 leading 1 bits,that is FF.FF.FE.0,what next hop the following will be delivered:**
2. C4.4B.31.2E
3. C4.5E.7E.12
4. C4.5E.D1.02

Table-1

|  |  |
| --- | --- |
| Netmask Length | NextHop |
| C4.5E.2.0/23 | A |
| C4.5E.4.0/22 | B |
| C4.5E.C0.0/19 | C |
| C4.5E.40.0/18 | D |
| C4.4C.0.0/14 | E |
| C0.0.0.0/2 | F |
| 80.0.0.0/1 | G |

题目意思和（2） 差不多，

subnetmask 为 netmask length 后的‘/xx’，

如第一个‘c4.5e.2.0/23’，则subnetmask 为23个1， 11111111.11111111.11111110.0（FF.FF.FE.0)

解答同（2）