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| Instructor |  | Due Date |  |

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| Part | **1** | **2** | **3** | **4** | Total |
| *Maximum Points* | **25** points | **25** points | **25** points | **25** points | **100**G101010 pointsG |
| ***Your Score*** |  |  |  |  |  |

**Textbook Reading Assignment**

Thoroughly read Chapter(s) 12 in your Computer Architecture and Organization textbook.

**Part 1 Glossary Terms - Network Organization and Architecture**

Define, in detail, each of these glossary terms from the realm of computer architecture and computer topics, in general. If applicable, use examples to support your definitions. Consult your notes

or course textbook(s) as references or the Internet by visiting Web sites such as:

[**http://www.bing.com**](http://www.bing.com) or [**http://www.webopedia.com**](http://www.webopedia.com/)

**(a) IoT**

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| The internet of things (IoT) refers to machine-to-machine network communications and encompasses any connected device (from RFID chips to “smart refrigerators” etc. etc.) |

**(b) IPv4**

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| Internet Protocol version 4 is a performs the duties of the network and data link layers in the OSI reference model, with its primary duty being to dvide TCP packets into protocol data units (PDUs) called datagrams, and then to attach routing information required to get the datagrams to their destinations.   IPv4 datagram headers contain a time to live (TTL) as well as a source and destination IP addresses, among other things.  IPv4 has many limitations, as it was designed and implemented when the massive scale of the internet, and the capabilities of future technology, were underestimated. Some of these limitations include a scarcity of available addresses, and short packet size. IPv6 addresses these limitations and then some. |

**(c) log 10 ( x )**

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| The logarithm is the inverse function of an exponent, e.g., the log base 10 of x would be whatever number n that 10 would need to be raised to in order to get x. This particular logarithm function can be used to find signal-to-noise ratio in network wiring. |

**(d) OSI**

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| The open systems interconnect (OSI) reference model was designed in response to the “tower of babel” situation wherein proprietary communication protocols foreshadowed a proprietary, closed, and less powerful internet.   The OSI standard consists of seven protocol layers. Two nodes communicating through such a model would need to step through each layer in tandem, engaging in “protocol conversations” that consists of handshakes (acknowledgements) and error-checking / parsing header data.   The seven protocol layers are: the physical layer, data link layer, network layer, transparent layer, session layer, presentation layer, and the application layer. |

**(e) WEP**

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| WEP (wired equivalence protocol) is a protocol (security algorithm) that is used to encrypt wireless network data (e.g., WiFi). |

**Part 2 Exercises - Network Organization and Architecture**

For each of the following, enter True or False.

**TRUE (1)** TCP is a connection - oriented protocol.

**FALSE (2)** One of the problems that IPv6 is intended to solve is the lack of class A address space.

**TRUE (3)** The aggregatable global unicast address format of IPv6 helps keep the size of router tables under control.

**TRUE (4)** It is possible for a single host to support both IPv4 and IPv6 .

**TRUE (5)** Security experts caution that wired equivalent privacy ( WEP ) is insufficient to block all types of network intrusion.

**TRUE (6)** It is possible for a computer with a single logical address to have more than one NIC each with distinct MAC addresses.

**FALSE (7)** Switches handle only one packet at a time while hubs can handle multiple incoming and outgoing packets simultaneously.

**FALSE (8)** Distance vector routing considers latency in the network before assigning a route to a packet.

**TRUE (9)** The Internet of Things ( IoT ) is used to describe intercommunicating control and sensory nodes.

**TRUE (10)** Because SCADA systems pre - date the Internet they not considered part of the IoT .

**Part 3 Exercises - Network Organization and Architecture**

**(1)** **( Protocols )**

How is a Network Layer protocol different from a Transport Layer protocol?

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| The network layer protocol is in charge of adding addressing information to the protocol data units that come from the transport layer above it. It also esatablishes the routes for moving PDU’s across intermediary nodes. It is in charge of knowing the best routes to send packets and addresses the packets with this information.  The transport layer provides quality assurance for layers above it in the protocol stack. It is a threshold between the network layer and the session layer, as anything that passes through the transport layer to the session would be considered to have no networking errors. It is essentially network QA. |

**(2)** **( History of Networks )**

List five important events in the history of computer networking.

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| In no particular order,  1. IBM develops systems network architecture (SNA), which is a specification for end-to-end communication between physical devices  2. US Military funds the cold-war era ARPANet to connect research instuations in the USA, designed to be redundant in vase of nuclear attacks. ARPANet eventually becomes DARPANet.  3. DARPANet is abandoned by military, absorbed by burgeoning national science foundation’s NSFnet, which is made public. Administration of the public internet falls to private corporations like Sprint, MCI, PacBell etc., who buy up NSFnet trunk lines (“backbones”) and sell access to internet service providers (ISPs).  4. Intenet standards begin to be developed via non-profit internet society ISOC, who develop and publish protocols as “requests for comments” (RFCs), the most important of which are RFC-971 (IPv4) and RFC-793 (TCP).  5. ISO / OSI protocol stack and reference model is developed, which provides a standard protocol for network communications; eventually this is superseded by TCP/IP model. |

**(3)** **( Network Traffic )**

In what way is the traffic of an early business computer network different from that of an early scientific - academic network? Is there such a distinction between these two types of systems today?

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| The former would probably have had proprietary communication protocols to protect their market share, while the latter would probably have had more open protocols. Today, business networks as well as campus networks use firewalls to control internet access but are otherwise the same and use the internet via TCP/IP. |

**(4)** **( ISO / OSI Protocol Stack )**

Why is the ISO / OSI protocol stack called a reference model? Do you think this will always be the case?

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| It’s a reference model because the implementation details differ. I think that this will always be the case so long as there are advances in technology and competition among physical component manufacturers. |

**(5)** **( Class A , B and C Networks )**

Into which class of networks do the following IP addresses fall?

(a) 180.265.14.3 (b) 218.193.149.222 (c) 92.146.292.7

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| **A: IPv4 class B**  **B: IPv4 class C C: IPv4 class A** |

**Part 4 Exercises - Network Organization and Architecture**

Write a complete answer for each of these.

**(1) ( Class A , B and C Networks )**

Into which class of networks do the following IP addresses fall?

(a) 191.57.229.163 (b) 223.52.176.62 (c) 127.255.255.2

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| **A: IPv4 class B**  **B: IPv4 class C**  **C: IPv4 class A** |

**(2) ( TCP / IP )**

What problems would present themselves if TCP did not allow senders and receivers to negotiate a timeout window?

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| Connections would never be torn down, leading to sockets being in use when they should be available. There’s also an error-checking aspect for timeouts, in that if a handshake isn’t acknowledged within a certain TTL, then the connection is dropped, as the link is either broken or the server is not acknowledging requestions for connections. You would never know if this was the case without a timeout. |

**(3) ( Signal - to - Noise Rating )**

The signal power for a particular class of network wiring is 8733.26 dB and the noise rating at that particular signal strength at 100MHz is 41.8 dB . Find the signal - to - noise ratio for this conductor.

Hint: apply this formula

Signal - to - Noise Ratio ( dB ) = 10 log 10 ( signal strength dB / noise rating dB )

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| **Answer:** 2.32 dB |

**(4) ( Signal - to - Noise Rating )**

The signal - to - noise rating for the network wiring in Part a is 9.5 dB and the noise rating is 36.9 dB when a 200MHz signal is transmitted. What is the signal strength?

Hint: apply this formula

Signal - to - Noise Ratio ( dB ) = 10 log 10 ( signal strength dB / noise rating dB )

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| **Answer:** .58 dB |

**(5) ( Signal - to - Noise Rating )**

The signal power for a particular class of network wiring is 2898 dB and the noise rating at that particular signal strength at 100MHz is 40 dB . Find the signal - to - noise ratio for this conductor.

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| **Answer:** 1.86 dB |