Solutions Week -1

1)What is the Hexadecimal equivalent of (98899910) 10?

Ans: (5E517C6)16

2) Convert the following numbers to base indicated and vice-versa (Cross-Verify)

a) (1101)2 => (35)8

b) (1111 1111 1110)2 => (4094)10

c) (221201)3=> (1018) 10

d) (76)8=> (62)10

e) (231)8 => (010011001)2

f) (0xF00)16 => (7400) 8

g) (0xDACE)16 => (284BA)12

h) (0x2B) 16=> (53) 8

3) Convert the following numbers to the base 10:

a) (3312) 8 => (1738)10

b) (167) 8 => (119)10

c) (202103) 9 => (119640)10

d) (3132334)16 => (51585844)10

e) (0xF2) 16 => (242)10

4) Convert the following base 10 numbers to the base

Indicated:

a) (5610)10 => (1010111101010)2

b) (5610)10 => (21200210)3

c) (5610)10 => (12752)8

d) (5610)10 => (32B6)12

e) (5610)10 => (15EA)16

f) (22110)10 => (101011001011110)2

g) (22110)10 => (1010022220)3

h) (22110)10 => (53136)8

i) (22110)10 => (10966)12

j) (22110) 10 => (565E)16

5) Convert the following floating numbers

1) (34.34)10

2) (125.125)10

3) (10.16)10

to binary, base 3, octal, and hexadecimal. Any fractions that do not terminate should be truncated to 4 digits in the fractional part.

1. a) (100010.0101)2 b) (1021.1000)3

c) (42.2650)8 d) (22.570A)16

1. a) (1111101.001)2 b) (11122.0101)3

c) (175.1)8 d) (7D.2)16

1. a) (1010.0010)2 b) (101.0110)3

c) (12.1217)8 d) (A.28F5)16

6) What is the largest positive number one can represent in a 12-bit 2's complement code? Write your result in binary and decimal?

Ans: (0111 1111 1111)2 and (2047)10

7) What are the 8-bit patterns used to represent each of the characters in the string "CODE/THS 2019"? (Only represent the characters between the quotation marks.)

Ans:

|  |  |  |
| --- | --- | --- |
| CHARACTER | ASCII | BINARY |
| C | 67 | 0100 0011 |
| O | 79 | 0100 1111 |
| D | 68 | 0100 0100 |
| E | 69 | 0100 0101 |
| / | 47 | 0010 1111 |
| T | 84 | 0101 0100 |
| H | 72 | 0100 1000 |
| S | 83 | 0101 0011 |
| SPACE | 32 | 0010 0000 |
| 2 | 50 | 0011 0010 |
| 0 | 48 | 0011 0000 |
| 1 | 49 | 0011 0001 |
| 9 | 57 | 0011 1001 |

8) What is the biggest binary number you can write with 5 bits?

Ans: (11111)2 => (31)10

9) In hex, 2BFC + 54A7?

Ans: 80A3

10) 10) Convert the hex number ABC7 to binary?

Ans: (1010 1011 1100 0111)2

11) In hex, AC74 − B3F?

Ans: A135

12) Convert the following binary fractions to ordinary fractions

● 0.1001 -> 0.5625

● 1.0011 -> 1.1875

● 1.1111 -> 1.9375

13) The decimal expansion of 11/17 is 0.647. Find the binary expansion of the fraction 11/17?

Ans: (0.1010010110100001110)2

14) The decimal expansion of 3/11 is 0.2727. Find the binary expansion of the fraction 3/11?

Ans: (0.0100010110011110)2

15) The decimal expansion of 11/17 is 0.647. Find the binary expansion of the fraction 11/17?

Ans: (0.1010010110100001110)2

16) The decimal expansion of 3/11 is 0.2727. Find the binary expansion of the fraction 3/11?

Ans: (0.0100010110011110)2

17) What is the significance of the 127.0.0.1 address?

Ans: 127.0.0.1 is the loopback Internet protocol (IP) address also referred to as the *localhost*. The address is used to establish an IP connection to the same machine or computer being used by the end-user.

18) How many bits are in IPv4 IPv6?

Ans: IPv4 -> 32bits, IPv6 -> 128bits

19) Convert this IP Address in Binary Dot Notation

11000000.10010000.00001010.00001010 into its equivalent decimal Dot Notation?

Ans: 192.144.10.10

20) What is the range of IPv4 addresses?

Ans: 0 – 255

21) Explain the Classification of IP Addresses?

Ans:

|  |  |  |
| --- | --- | --- |
| Class | Range | Leading Bit |
| Class A | 0.0.0.0 – 127.255.255.255 | 0 |
| Class B | 128.0.0.0 – 191.255.255.255 | 1 |
| Class C | 192.0.0.0 – 223.255.255.255 | 11 |
| Class D | 224.0.0.0 – 239.255.255.255 | 111 |
| Class E | 240.0.0.0 – 255.255.255.255 | 1111 |

22) Why are we running out of IPv4 Addresses?

Ans: Because the original Internet architecture had fewer than 4.3 billion addresses available, and today we have more 26 billion devices connected to the internet. We officially ran out of IPv4 in November, 2019.

23) Can a device have both IPv4 and IPv6 address simultaneously?

Ans: Yes, a device may have both an IPv6 and an IPv4 address. It is called dual stack.

24) IPv4 classification is done on which octet of IPv4 address format?

Ans: 1st octet

25) Class E IP Addresses are currently used for which purpose?

Ans: This IP Class is reserved for experimental purposes only for R&D or Study.

26) Which class does this IP address 224.255.255.1 belong to?

Ans: Class D

27) What are Private IP Addresses and What is their range?

Ans: A private IP address is an IP address that's reserved for internal use behind a router or other Network Address Translation (NAT) device, apart from the public.

Ranges:

* 10.0.0.0 to 10.255.255.255
* 172.16.0.0 to 172.31.255.255
* 192.168.0.0 to 192.168.255.255

28) Given an IP Address can I differentiate between Public and Private IP Address?

Ans: Yes, An IP address is considered private if the IP number falls within one of the IP address ranges reserved for private networks, else it is public.

29) Define Port? What does the Port Number represent?

Ans:

**Port**: It is a logical construct assigned to network processes so that they can be identified within the system.

**Port Number**: It is a way to identify a specific process to which an Internet or other network message is to be forwarded when it arrives at a server. They are necessary to differentiate between many different IP services, such as web service (HTTP), mail service (SMTP), and file transfer (FTP).

30) Port numbers used by HTTP, FTP, HTTPS, SMTP are?

Ans: HTTP = 80 | FTP = 20/21 | HTTPS = 443 | SMTP = 25

31) What is a web server and client? Command used to start a simple python HTTP server in Linux?

Ans:

**Web Server**: A Web server is a system program that deals with the client’s request and provides it with web pages that use HTTP and FTP to deliver the files that serve web pages to users.

**Web Client**: It is an application or web browser that communicates with a web server installed on a computer, using HTTP.

Command to start simple python HTTP server:

In python 2.7:

sudo python –m SimpleHTTPServer 8080

In python 3:

sudo python3 –m http.server 8080

32) What is the difference between URI, URL, URN?

Ans:

**URI**: A string of characters used to identify a resource on the internet either by name or location or both.

**URL:** A string of characters which is part of URI that indicates the name

**URN**: A string of characters which is part of URI that refers to just the address.

URI = URL + URN

33) What are Server side programming languages? Name a few server side programming languages?

Ans: Languages used to develop programs that are executed by the servers are called Server side programming Languages.

E.g.: PHP, Python, Ruby, C#, and NodeJS(JavaScript).

34) Can JavaScript be considered as a client side programming language?

Ans: Yes, JavaScript is a client-side scripting language because the source code is processed by the client's web browser.

35) What does the DNS server consist of and what is the importance of it? Define Root Servers?

Ans: A DNS Server consists of 4 parts. To resolve a DNS query these parts are used:

* **A DNS Resolver**: Receives the request to resolve the domain name with the IP address.
* **A Root Server**: The root server receives the first request, and returns a result to let the DNS resolver know what the address of the Top-Level Domain (TLD) server that stores the information about the site. A top-level domain is the equivalent of the *.com*or *.net* portion of the domain name you entered into the address bar.
* **A TLD Server**: The DNS resolver then queries this server, which will return the Authoritative Name Server where the site is actually returned.
* **An Authoritative Name Server**: Finally, the DNS resolver queries this server to learn the actual IP address of the website you're trying to deliver.

**Importance of DNS**: DNS is used to convert IP addresses into readable domains such as bbc.co.uk. Without DNS, everyone would have to remember random strings of number to access different websites, or at least Google’s IP address.

**Root Servers**: There are 13 important DNS root servers on the internet that store a complete database of domain names and their associated public IP addresses. These top-tier DNS servers are named A through M for the first 13 letters of the alphabet. Ten of these servers are in the US, one in London, one in Stockholm, and one in Japan.

36) What is DNS spoofing?

Ans: Domain Name Server (DNS) spoofing (a.k.a. DNS cache poisoning) is an attack in which altered DNS records are used to redirect online traffic to a fraudulent website that resembles its intended destination.

37) What are Status Codes in HTTP? What are HTTP Request Methods? HTTP Status Codes 200, 400, 502 and 201 for?

Ans: HTTP status codes indicate whether a specific HTTP request has been successfully completed. Status codes are issued by a server in response to a client's request made to the server.

**HTTP Request Methods**: HTTP defines a set of request methods to indicate the desired action to be performed for a given resource. Eg: POST, GET, PUT, DELETE, PATCH etc.

HTTP Status Codes:

**200** -> OK. The request has succeeded.

**400** -> Bad Request. The server could not understand the request due to invalid syntax.

**502** -> Bad Gateway. This error response means that the server, while working as a gateway to get a response needed to handle the request, got an invalid response.

**201** -> Created. The request has succeeded and a new resource has been created as a result. This is typically the response sent after POST requests, or some PUT requests.

38) What is the role of Model, View and Controller in MVC architecture? Role of Client and Server in Client Server Architecture?

Ans:

**Model** − The lowest level of the pattern which is responsible for maintaining data.

**View** − This is responsible for displaying all or a portion of the data to the user.

**Controller** − Software Code that controls the interactions between the Model and View.

**Role of Server** – Server hosts, delivers and manages most of the resources.

**Role of Client** – It makes requests and consumes the services.

39) What is a Compiler, how is JavaScript code executed? Using Compiler or interpreter?

Ans:

**Compiler**: A program that converts instructions into a machine-code or lower-level form so that they can be read and executed by a computer.

**JS Execution**: JavaScript us executed using Interpreter.

40) What is a JIT (Just In Time compilers), what is their role in the modern day web Browsers?

Ans: Just-in-time compilation is a method for improving the performance of interpreted programs. During execution, the program may be compiled into native code to improve its performance. It is also known as dynamic compilation.

Modern day browsers use JIT compilation, which compiles JavaScript to executable bytecode just as it is about to run which makes it more performant.

41) What is the purpose of VPN? How are VPN and Firewalls Related?

Ans:

**VPN**: It gives you online privacy and anonymity by creating a private network from a public internet connection. VPNs mask your internet protocol (IP) address so your online actions are virtually untraceable

**Firewall:** A firewall is a network security device that monitors incoming and outgoing network traffic and permits or blocks data packets based on a set of security rules.

**VPN and Firewall Relationship**: The VPN can be configured to allow users to bypass restrictions put in place by the firewall. This happens because to the firewall, the VPN appears as a separate network within the local facility which is different from typical scenario where all traffic is blocked from flowing from the VPN network to or from the local network.