**Department of Information Technology**

**Mid Term Examination SH-2022**

Subject: WEB X.0 Class/Sem: TEIT (VI) A & B

Time: 2:00 to 3:00 Date: 21/2/2023 Max. Marks: 20

Q1 A) Give access modifiers. 2M

TypeScript supports three access modifiers - public, private, and protected.

1. Public - By default, members (properties and methods) of the TypeScript class are public - so you don’t need to prefix members with the public keyword. Public members are accessible everywhere without restrictions even from the multiple level sub-classes without any compile errors.
2. Private - A private member cannot be accessed outside of its containing class. Private members can be accessed only within the class and even their sub-classes won't be allowed to use their private properties and attributes.
3. Protected - A protected member cannot be accessed outside of its containing class. Protected members can be accessed only within the class and by the instance of its sub/child class.

Q1B) Compare Web 1.0,Web 2.0, Web 3.0 2M

### **Difference between Web 1.0, Web 2.0**,**and Web 3.0 –**

| **S. No.** | **Web 1.0** | **Web 2.0** | **Web 3.0** |
| --- | --- | --- | --- |
| 1. | Mostly Read-Only | Wildly Read-Write | Portable and Personal |
| 2. | Company Focus | Community Focus | Individual Focus |
| 3. | Home Pages | Blogs / Wikis | Live-streams / Waves |
| 4. | Owning Content | Sharing Content | Consolidating Content |
| 5. | WebForms | Web Applications | Smart Applications |
| 6. | Directories | Tagging | User behavior |
| 7. | Page Views | Cost Per Click | User Engagement |
| 8. | Banner Advertising | Interactive Advertising | Behavioral Advertising |
| 9. | Britannica Online | Wikipedia | The Semantic Web |
| 10. | HTML/Portals | XML / RSS | RDF / RDFS / OWL |
| 11. | Data was not Focused. | Data of many was controlled by some mediatory. | Data was personalized and no use of mediatory. |
| 12. | Information sharing is the goal. | Interaction is the goal. | Immersion is the goal. |
| 13. | It connects information as its primary goal. | It aims to connect people. | Focuses on relating knowledge. |
| 14. | Static websites | Introduction of web applications | Intelligent web-based functions and apps |
| 15. | A simpler, more passive web. | An enhanced social Web | A semantic web exists. |
| 16. | Web and File Servers, HTML, and Portals are technologies connected to Web 1.0. | AJAX, JavaScript, CSS, and HTML5 are examples of related technology. | Web 3.0 technologies include blockchain, artificial intelligence, and decentralized protocols. |
| 17. | **Associated Technologies**   * Web and File Servers * Search Engines (including AltaVista and Yahoo!) * E-mail accounts (Yahoo!, Hotmail) * Peer-to-Peer File Sharing (Napster, BitTorrent) and others. | **Associated Technologies**   * Frameworks for Ajax and JavaScript * Microsoft.NET * Blogs * Wikis and others. | **Associated Technologies**   * Searching Using Semantics * Databases of Information * Ontologies * Intelligent Digital Personal Assistants and others. |

Q1 C) List technologies used in AJAX 1M

# AJAX Technologies

As describe earlier, ajax is not a technology but group of inter-related technologies. [AJAX](https://www.javatpoint.com/ajax-tutorial) technologies includes:

* [HTML](https://www.javatpoint.com/html-tutorial)/[XHTML](https://www.javatpoint.com/xhtml-tutorial) and [CSS](https://www.javatpoint.com/css-tutorial)
* DOM
* [XML](https://www.javatpoint.com/xml-tutorial) or [JSON](https://www.javatpoint.com/json-tutorial)
* [XMLHttpRequest](https://www.javatpoint.com/understanding-xmlhttprequest)
* [JavaScript](https://www.javatpoint.com/javascript-tutorial)

Q2) Discuss factors for measuring the success of E-commerce website.

### 1. Conversion rate

Conversion is one of the most straightforward e-commerce metrics to measure. Put simply, your conversion rate is the number of site visits you receive divided by the total number of transactions. So, if you receive 5000 site visits and 400 of those result in a purchase, you would have a sales conversion rate of 8%.

Your success at converting lookers into buyers is one of the biggest indicators of whether your offerings are attractive to your target audience. Conversion can also be used to track the success of specific marketing efforts, such as SEO or influencer campaigns.

#### How to measure conversion rate

As we demonstrated above, it’s easy enough to work out your e-commerce conversion rate. However, this doesn’t tell you whether there’s a specific point in the shopping journey where potential customers are exiting the sales funnel. This is why it’s a good idea to take a funnel-based view of conversion and get a better understanding of what’s happening on your e-commerce website.

An e-commerce shopping journey is made up of a series of step-by-step touchpoints; entering your website, browsing product pages, checking FAQs, adding products to the shopping cart, and finally making a transaction. Knowing where and when you’re seeing a major drop-off in customers will tell you where to focus your conversion rate optimization efforts.

For example, if your conversion rate drops sharply after site visitors look at your FAQs, this warrants further investigation. For example, if your [e-commerce returns policy](https://whiplash.com/blog/write-ecommerce-returns-policy/) is strict where competing retailers aren’t, you may need to adjust this to remain relevant to potential customers.

### 2. Customer acquisition cost (CAC)

While the ideal scenario would be to attract customers entirely by organic means, this isn’t the reality for most businesses. As e-commerce grows more competitive, brands are forced to spend more on acquiring customers.

But if the cost of attracting leads only results in a handful of conversions, it’s a recipe for putting yourself out of business. This is because customer acquisition can cost up to [7 times more](https://neilpatel.com/blog/retaining-customers/) than selling to existing customers.

#### How to measure customer acquisition cost

Customer acquisition cost is expressed as the sum of your total sales and marketing costs for a specified period, divided by the total number of new customers acquired. This includes email marketing, paid search, social media campaigns, and any other investment that’s designed to increase the number of visitors and conversions on your site.

It’s tempting to approach customer acquisition like spaghetti; chucking it on the wall and seeing what sticks. But when costs begin to outweigh the gains, you’ll need to take a closer look at whether or not your sales and marketing efforts are paying off.

However, there are some caveats. Looking at acquisition cost alone can give an inaccurate perception of ROI. If a high CAC is outstripped by your average order value and customer lifetime value, this demonstrates a healthy bottom line.

### 3. Average order value (AOV)

Your average order value refers to the average transaction that takes place on your e-commerce site. Merchants should aim to increase their AOV over time as customer loyalty grows, which means higher customer lifetime value.

Average order value is a particularly favorable e-commerce metric because it’s easy to influence without a lot of marketing spend. For example, [customer loyalty programs,](https://whiplash.com/blog/revamp-customer-loyalty-program/)upselling/cross-selling, and online sales are all great strategies to increase AOV. This is much more economical can trying to add new customers or entice existing customers to purchase more often.

#### How to measure average order value

AOV is calculated by taking the total revenue over a specified period, divided by the total number of orders you’ve received. So, if your total revenue is $80,000 and your total number of orders is 600, your AOV is $133.

### 4. Social media engagement

Social media is a critical marketing channel for direct-to-consumer brands that don’t have a brick-and-mortar presence. As a major source of referral website traffic, you want to keep a close eye on how your social media content is performing.

#### How to measure social media engagement

Success on social media can be tricky for marketers to measure because it doesn’t boil down to any one metric. Rather, you need to use a collection of e-commerce metrics to determine whether your content is resonating with customers.

As we mentioned earlier, social media metrics such as ‘likes’ are mostly cosmetic because they don’t indicate that a viewer has taken any further action. These metrics provide much stronger insights into whether your marketing efforts are effective:

**Click-through rate.**This is a great metric to determine whether your followers are taking action in response to your CTAs. Your CTR is calculated by the number of clicks on your content versus how many times an ad or post is viewed. If your CTR is high, then this is a good indication that your content is effective.

**Referrals.**Referral traffic refers to users that come to your e-commerce site from another location i.e. a social media site. Google Analytics can also break can this down for you into separate social media channels so you can see which is giving you the highest number of referrals.

**Social conversions.**If a customer purchases on your site in the same session as a visit to one of your social media channels, this counts as a social conversion. It demonstrates that your social channels are playing a key role in driving nurtured leads to your site.

### 5. Bounce rate

Bounce rate refers to the number of people who navigate away from your site after viewing only one page. This is expressed as a percentage of your total visitors.

While it’s desirable to keep your bounce rate as low as possible, [a bounce rate lower than 25%](https://www.searchenginejournal.com/website-bounce-rate/332439/) could be an indication that something is going wrong with your website. The same goes for high bounce rates over 80%. In that 25%-80% range, what is classified as a ‘bad’ bounce rate will depend on what your website does. For e-commerce stores, a bounce rate of 45.68% is considered average, as consumers are likely to be browsing multiple product pages.

#### How to measure bounce rate

​High bounce rates can be caused by a variety of factors, such as poor user experiences, slow site speed, or low-quality content.

However, it can also be a sign that your customers have found exactly what they’re looking for. That’s why it’s important to look at your bounce rate in the context of Average Session Duration on Google Analytics. If people are consistently spending more than two minutes on your page, it’s a good sign that they’re interested in your products.

### 6. Return rate

This is one e-commerce metric that many merchants would prefer to ignore. We all know that returns are a major problem in e-commerce, but ignoring them certainly won’t make them go away. The average return rate in e-commerce is 20%-30%, but this can jump as high as 40% for product categories such as apparel. So, your business must understand why this is taking place and whether it’s something that’s within your control.

#### How to measure return rate

If you’ve made any changes to your e-commerce return policy, it’s really important to monitor whether this is having a knock-on effect on return rates. Remember: High return rates aren’t necessarily a bad thing. If you have a generous exchange and returns policy, this is more likely to attract more consumers to your store and even result in repeat purchases; [92% of shoppers](https://www.business2community.com/infographics/e-commerce-product-return-statistics-trends-infographic-01505394#:~:text=Statistic%20from%20eConsultancy%20show%2056,page%20before%20making%20a%20purchase.) say they would buy something again if they are happy with a return policy.

However, returns could also be a symptom of something else, such as poor sizing information or imagery on your product pages that drives customers to [bracket their purchases](https://whiplash.com/blog/how-to-combat-bracketing/). So, in addition to measuring your return rate, you also need to be gathering information from customers about their reasons for returning.

### 7. Shopping cart abandonment rate

Getting consumers to put items in their cart is one thing, but persuading them to follow through with a purchase is a much bigger challenge. Just like returns, shopping cart abandonment is an inevitable part of e-commerce. But those almost sales can quickly add up to a lot of lost revenue. That’s why it’s important to investigate what’s causing cart abandonment, such as:

* High shipping costs or additional fees
* A lack of payment options
* Slow loading speed
* Security concerns
* No guest checkout

#### How to measure shopping cart abandonment rate

It’s possible to drill down on cart abandonment in much more detail to figure out what’s causing customers to abandon their carts – including at what point in the journey this takes place.

For example, checkout abandonment looks specifically at how many customers abandon their cart after beginning the checkout process. This allows you to focus your efforts on eliminating friction within the payment process and opt-ins such as email and T&Cs.

### 8. Percentage of repeat customers vs. first-time customers

Your percentage of new vs. existing customers is a reflection of your customer retention rate and is closely tied to your customer acquisition costs. If returning customers are already familiar with your brand and offerings, the cost of acquisition will be much lower.

Ideally, you want to have a slightly higher percentage of returning customers than new customers. If the opposite is true, this indicates that you could be having trouble fostering brand loyalty in your customers – and your CAC will be considerably higher.

#### How to measure repeat customers vs. first-time customers

You can find the new vs returning visitor report in Google Analytics, which will also supply information on average session length and the number of transactions resulting from each user type. This allows you to spot key differences in customer behavior, such as the length of time they spend on product pages.

Something you’ll likely spot right off is that conversion rates will be higher for returning customers than they are for first-time customers. This is because first-time customers will want to invest more time comparing options before committing to a purchase.

### 9. Customer lifetime value (CLV)

It’s a serious error to measure the value of your customers one sale at a time. A customer who splashes out on a high-value item and never stops with you again will be worth less than one who makes several smaller purchases over a longer period of time. That’s why we use customer lifetime value (CLV) to track the revenue that customers generate throughout their relationship with you.

#### How to measure customer lifetime value

The easiest way to measure customer lifetime value is to multiply your average order value by the average number of purchases per year by the average time a customer is retained for. So, if your AOV is $100, average purchases 7, and customer retention 5 years, your CLV would be expressed like this:

**100 x 7 x 5 = $3500**

However, it’s a good idea to factor customer acquisition cost into this equation by deducting it from your CLV. This is a better reflection of how your marketing spend is contributing to CLV.

### 10. Net promoter score (NPS)

Customer satisfaction is a vital e-commerce metric, but also very subjective. How can you substantiate what customers think about your brand and the service they receive? Customer surveys are very popular for this purpose, but getting customers to fill them out can be quite a challenge. Net Promoter Scores (NPS) offer a much less time-intensive alternative by simply asking customers on a 1 to 10 scale how likely they are to recommend you to others.

#### How to measure net promoter score

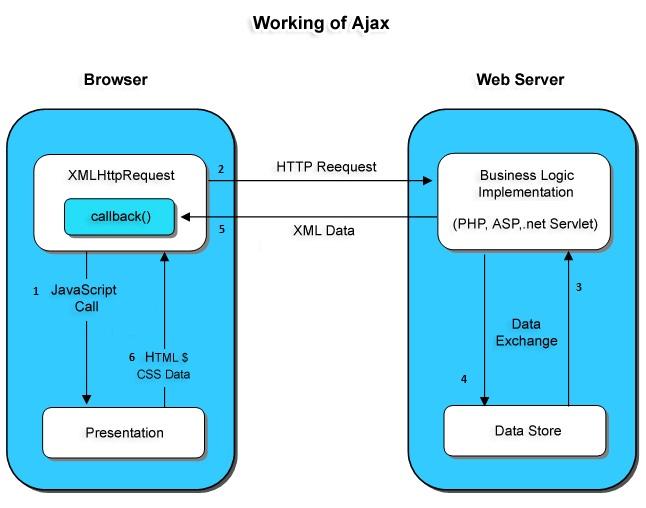
Net promoter score segments your customers into groups depending on how they answer your survey. This allows you to tailor your nurturing strategies accordingly and help recapture customers who may have had a negative experience with follow-ups:

* **Promoters (9-10)**
* **Neutral (7-8)**
* **Detractor (0-7)**

Q3) Explain working of AJAX with suitable diagram.

## Working of Ajax

Ajax communicates with the server by using XMLHttpRequest Object. User send request from User Interface and JavaScript call goes to the XMLHttpRequest Object after that XMLHttp request is sent to the XMLHttpRequest Object. At that time server interacts with the database using php, servelet, ASP.net etc. The data is retrieved then the server sends data in the form of XML or Jason data to the XMLHttpRequest Callback function. Then HTML and CSS displayed the Data on the browser. These all above process we discuss in point by point format for better understanding.



### Working of Ajax

* User sends a request from the UI and a javascript call goes to XMLHttpRequest object.
* HTTP Request is sent to the server by XMLHttpRequest object.
* Server interacts with the database using JSP, PHP, Servlet, ASP.net etc.
* Data is retrieved.
* Server sends XML data or JSON data to the XMLHttpRequest callback function.
* HTML and CSS data is displayed on the browser.

In Ajax model, there is an Ajax engine involved in between the user and the server, which eliminates the to and fro from the user to the server and back. This Ajax engine is written in JavaScript and is in a hidden frame. It handles the user front by communicating to the user as well as handles the server front by itself. This way, the end user barely faces a waiting period.

Q4) Explain click stream analysis in brief.

In website analytics, a clickstream or click path is the sequence of pages a user visits on a website. Thus, clickstream analysis is simply the process of analyzing what pages a user visits (and in what order) on a website. This allows webmasters to better understand how their website is being used, and where they can make improvements.

Often, clickstream analysis factors in various analytics, such as user or session analytics, to compare how different groups of users interact with the same website. User analytics, like the user’s gender (if that data is available), allow webmasters to see how their content appeals to different audiences. Session analytics, like how the user reached the website, allow webmasters to compare their traffic sources.

## How to Do Clickstream Analysis

Clickstream analysis is surprisingly easy to get started with. In just four steps, you can begin to gain insights on the behavior of your website’s users.

### 1. Understand your objectives

It may sound cliche, but the first step in effective clickstream analysis is understanding your objectives. Its helpful to know whether you are using clickstream analysis to review your traffic channels and advertising strategies or to improve your content and its interlinking. Once you know this, the remaining steps will be much easier.

### 2. Collect and visualize data

Like with any data analysis, the next step in clickstream analysis is to collect the data itself. There are numerous ways to collect clickstream data which we’ll discuss later. Following the collection, it’s helpful to have a way to visualize or otherwise review the data in a convenient format. This may be offered by the same tools used for data collection.

### 3. Identify patterns and exceptions

Generally speaking, [data analysis](https://pestleanalysis.com/data-analysis/) is all about identifying patterns and exceptions. Regardless of what you are trying to achieve with clickstream analysis, you will want to look at patterns and exceptions in the way users interact with your pages. If you are comparing traffic channels or advertising strategies, also look at patterns and exceptions in how users from varying sources interact with your website.

### 4. Draw and implement conclusions

After analyzing the patterns and exceptions in clickstream data, you should be able to draw conclusions about the pages on and users of your website. Finally, you can implement these conclusions to improve your website.

Q5) Explain function overloading with example.

# TypeScript Function Overloading

Function overloading is a mechanism or ability to create multiple methods with the **same name** but different parameter types and **return type**. However, it can have the same number of parameters. Function overloading is also known as method overloading.

The Function/Method overloading is allowed when:

* The function name is the same
* The number of parameters is different in each overloaded function.
* The number of parameters is the same, and their type is different.
* The all overloads function must have the same return type.

Suppose we have to perform **multiplication** of the numbers, which has a different number of parameters. We write the **two** methods such as mul\_a(number, number) for **two parameters**, and mul\_b(number, number, number) for **three parameters**. Now, it may be difficult for us as well as other programmers to understand the behavior of the method because its name **differs**. In that case, we need to use function overloading, which increases the readability of the program.

**Example**

//Function with string type parameter

function add(a:string, b:string): string;

//Function with number type parameter

function add(a:number, b:number): number;

//Function Definition

function add(a: any, b:any): any {

    return a + b;

}

//Result

console.log("Addition: " +add("Hello ", "Typescript"));

console.log("Addition: "+add(30, 20));

In the above example:

* The first **two** lines are the function overload **declaration**. It has two overloads:
  + A Function which accepts a **string** parameter.
  + A Function which accepts a **number** parameter.
* The third line is the **function definition**, where the data type of the parameters is set to **any**.
* The last two statements **invoke** the overloaded function.

After compiling the above TypeScript program, we will get the following JavaScript code.

//Function Definition

function add(a, b) {

    return a + b;

}

//Result

console.log("Addition: " + add("Hello ", "Typescript"));

console.log("Addition: " + add(30, 20));

**Output:**

Addition :Hello Typescript

Addition :50

## Function overloading in a class

The following example helps to understand the use of method overloading in a class.

class A

{

    public foo(s: string): number;

    public foo(n: number): string;

    public foo(arg: any): any

    {

        if (typeof(arg) === 'number')

            return arg.toString();

        if (typeof(arg) === 'string')

            return arg.length;

    }

}

let obj = new A();

console.log("Result: " +obj.foo(101));

console.log("Length of String: " +obj.foo("JavaTpoint"));

After compiling the above TypeScript program, we will get the following JavaScript code.

class A {

    foo(arg) {

        if (typeof (arg) === 'number')

           return arg.toString();

     if (typeof (arg) === 'string')

            return arg.length;

    }

}

let obj = new A();

console.log("Result: " + obj.foo(101));

console.log("Length of String: " + obj.foo("JavaTpoint"));

**Output:**

**Result:101**

**Length of String:10**