

**Question 1: Multiple Choice Questions****(15 Points)**

- Multiple choice question answers where one or more answers can be correct

**Question 2: State the following as True or False and in case of false, justify your answer.****(5 Points)**

- True/False statements. Justify only the false ones

**Question 3: Answer the following questions briefly.**

1. Discuss a solution for "Threads that need writer locks while they hold reader locks will result in deadlocks." **(5 Points)**
2. Discuss the terms Vertical Scaling and Horizontal Scaling? What would be the first option considering the time and cost factors respectively? **(5 Points)**
3. What are the advantages of LINQ? Consider the following array of size 10, write a LINQ statement to calculate average of elements between index 1 to index 9 (inclusive) of the array. **(5 Points)**  
`Int[] nums = new int[] { 0 , 2 , 4 , 6 , 8 , 10 , 1 , 3 , 5 , 7 };`
4. Explain four different HTTP Verbs and their usage. **(5 Points)**
5. Compare any four of the following: **(8 Points)**
  - a. View Models versus Data Models
  - b. ASP.Net Web Site versus ASP.Net Web Application
  - c. REST versus SOAP
  - d. Tier versus Layer
  - e. Value type variables versus reference type variables

**Question 4: Explain the following questions. You may use diagram or code snippets where necessary**

1. What is the purpose of using `GET_FILESTREAM_TRANSACTION_CONTEXT()` function while adding a file through SQL File Stream Functionality? Explain using code snippets. **(8 Points)**
2. Briefly explain the Broker / Proxy Design Pattern using an example of web service. **(8 Points)**
3. What are extension methods? Write an extension method "CharacterCount" in C# which returns every English character with the number of times it was used in the input string in the alphabetic order. Following is a sample input / output. **(8 Points)**

**Input:**

```
string str = "Hello World. Welcome to the Final Examination of IPT. Will you pass the course?"
var Dictionary = str.CharacterCount();
```

**Output:**

```
a:4    b:0    c:2    d:1    e:7    f:2    g:0    h:3    i:5
j:0    k:0    l:7    m:2    n:3    o:8    p:2    q:0    r:2
s:3    t:5    u:2    v:0    w:3    x:1    y:1    z:0
```

4. You have been hired to develop a Web API for an Inventory Management System. Create a RESTful Web Service that will be used to store inventory related Information in a MS SQL database. The Web Service can perform the following actions: **(10 Points)**
  - Add Product(s) to Inventory
    - (single or multiple products simultaneously)
  - Sell Product from Inventory
    - Removes a Product from Inventory
  - Add Vendor
    - Adds a supplier details
  - Add Vendor Products
    - Associate products which a particular supplier would be selling.
  - Get List of Products less than threshold (consider threshold is 20 for all products)
    - Display Product Code, Product Name, Supplier Name, Supplier Email Address for products that have quantity less than 20

**Product:**

Each Product has the following details:

- a. Product Code
- b. Name

c. Category

- Supplier ID
- Name
- Email
- Contact No

**Supplier:**

Supplier has following details:

5. Write SQL queries for the following (should have valid MS SQL Server syntax)

WorkerID	FirstName	LastName	Salary	Department
0001	Sohaib	Khan	100000	HR
0002	Asad	Ali	80000	Admin
0003	Amber	Sohail	300000	HR
0004	Sarfaraz	Ahmed	500000	Admin
0005	Waseem	Ahmed	500000	Admin
0006	Bilal	Mehmood	200000	Account
0007	Javeria	Zafar	75000	Account
0008	Noman	Altaf	90000	Admin

a. Write an SQL Query to Print the Name of Employees Having the Highest Salary in Each Department. (Output columns: FirstName, Salary, Department) (4 Points)

b. Display all even rows in Employee Table. (4 Points)

6. A long passage on Scalability of Systems followed by few questions (10 Points)

I. What architectural design would you recommend?

**BEST OF LUCK!**