Instructions:

- Return the question paper.
- Read each question completely before answering it. There are **4 questions and 3 pages (2 sides each)**.
- In case of any ambiguity, you may make assumption. But your assumption should not contradict any statement in the question paper.
- All the answers must be solved according to the sequence given in the question paper.
- This paper is subjective
- Do not write anything on the paper except for your student id and section

Time: 180 minutes. **Max Marks:** 100 points

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

1. Can you overload a function with the same number and types of arguments (parameters) but with a different return type?

a) Yes
b) No
c) Yes, but only if function is static
d) Yes, but only if function is virtual

2. Which of the following statements is correct about constructors in C#.NET?

a) A constructor cannot be declared as private
b) A constructor cannot be overloaded
c) A constructor can be a static constructor
d) None of the mentioned

3. What is the value returned by the function CompareTo() if the invoking string is less than the string compared?

a) zero
b) value less than zero
c) value greater than zero
d) none of the mentioned

4. Which of these keywords are used for generating an exception manually?

a) try b) catch c) throw d) check

5. Select differences between reference type and value type:

1. Memory allocated to 'Value type' is from heap and reference type is from 'System. ValueType'
2. Memory allocated to 'Value type' is from 'System. ValueType' and reference type is from 'Heap'
3. Structures, enumerated types derived from 'System. ValueType' are created on stack, hence known as ValueType and all 'classes' are reference type because values are stored on heap.

a) 1, 3 b) 2, 3 c) 1, 2, 3 d) 1

6. Which of the following are true about Extension Methods?

a) They can be declared either static or instance members.
b) Extension methods can be used to override existing instance methods
c) Extension methods with the same signature for the same class may be declared in multiple namespace without causing compilation errors.
d) They must be declared in the same assembly (but may be in different source files)

7. For the given set of codes, what is the output?

```
1.  class Program
2.  {
3.      static void Main(string[] args)
4.      {
5.          int[] nums = { 1, -2, -3, 5 };
6.          var posNums = from n in nums
7.                        orderby n descending
8.                        select n*4 / 2;
```

```
9.          Console.Write("The values in nums: ");
10.         foreach (int i in posNums) Console.Write(i + " ");
11.         Console.WriteLine();
12.         Console.ReadLine();
13.       }
14.   }
```

a) 10 2 -4 -6 b) 5 1 -2 -3 c) 1 5 -2 -3 d) Run time error

8. Which of the following statements are correct with regard to Polymorphism?

a) Polymorphism is a process by which a class can exist in multiple forms
b) Polymorphism is a process by which a class can exist in only two forms
c) Polymorphism is a process by which objects of a reference type can display different behavior
d) Polymorphism is a process by which different instances of the same class display different behavior
e) Polymorphism allows old code in a class library to call new code written by a programmer that derives a class from a class in the class library.

9. Choose the namespace in which the interface IEnumerable is declared?

a) System.Collections
b) System.Collections.Generic
c) Both a & b
d) None of the mentioned

10. Which of the following statements are correct?

a) There is one garbage collector per program running in memory
b) There is one common garbage collector for all programs
c) To garbage collect an object set all references to it as null
d) We have to specifically run the garbage collector after executing VISUAL STUDIO.NET

11. Correct statement about strings are?

a) a string is created on the stack
b) a string is primitive in nature
c) a string created on heap
d) created of string on a stack or on a heap depends on the length of the string

12. Select the statements which define the stream

a) A stream is an abstraction that produces or consumes information.
b) A stream is linked to a physical device by the I/0 system
c) C# programs perform I/O through streams
d) All of the mentioned

13. Which datatype should be more preferred for storing a simple number like 35 to improve execution speed of a program?

a) sbyte
b) short
c) int
d) long

14.What will be the size of the object created by the following C#.NET code snippet?

```
namespace ConsoleApplication
{
    class Baseclass
    {
        private int i;
        protected int j;
        public int k;
    }
    class Derived: Baseclass
    {
        private int x;
        protected int y;
        public int z;
    }
    class MyProgram
    {
        static void Main (string[ ] args)
        {
            Derived d = new Derived();
        }
    }
}
```

a) 24 bytes
b) 12 bytes
c) 20 bytes
d) 10 bytes
e) 16 bytes

15. Brokers patterns can be used for which of the following reasons?

a) Simplify the Supplier
b) Decompose the supplier
c) Facilitate Client/Server interface
d) All of the mentioned

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

1. Hardware Load balancers are faster whereas Software Load balancers are more customizable.
2. There is no project file (.csproj or vbproj) in an ASP.Net Web Application.
3. Varbinary(max) can store maximum 4GB of data.
4. Dynamic datatype is useful with COM objects.
5. **IComparer** interface provides a way to customize the sort order of a collection.

Question 3: Answer the following questions briefly.

1. Discuss the terms Thin and Fat clients by providing an example of a working system **(5 Points)**
2. Explain four different HTTP Verbs and their usage. **(5 Points)**
3. Compare any three of the following: **(3 Points each)**
   a. View Models versus Data Models
   b. Tier versus Layer
   c. Select() versus SelectMany()
   d. REST versus SOAP

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

1. What is the purpose of using FileContent.PathName() function while adding a file through SQL File Stream Functionality? Explain using code snippets. **(8 Points)**

2. You have been hired to develop a Web API for a currency conversion system. Your API will have a fixed list of currencies and their conversion rates from US Dollar hardcoded. You have to provide the following functionalities: **(8 Points)**
   a. Get List of all Currencies and their rates against 1 US Dollar.
   b. A method to convert currency from one to another. Your method would include 3 parameters, one for Source Currency, one for value to be converted, one for Destination Currency).

3. Your university is planning to change the grading policy as following: **(8 Points)**

a. Every student receives a grade in the inclusive range from 0 to 100.
b. Any grade less than 40 is a failing grade.

One of your teachers likes to round each student's grade according to these rules:

- If the difference between the grade and the next multiple of 5 is less than 3, round grade up to the next multiple of 5.
- If the value of grade is less than 38, no rounding occurs as the result will still be a failing grade.

For example, grade = 84 will be rounded to 85 but grade = 29 will not be rounded because the rounding would result in a number that is less than 40.

Given the initial value of grade for each of the students, write code to automate the rounding process.

Function Description

Complete the function gradingStudents. It should return an integer array consisting of rounded grades. gradingStudents has the following parameter(s):

- grades: an array of integers representing grades before rounding

Sample Input:
73 67 38 33

Sample Output:
75 67 40 33

ID	Original Marks	Final Marks
1	73	75
2	67	67
3	38	40
4	33	33

```
class Result
{
  /*
   * Complete the 'gradingStudents' function below.
   *
   * The function is expected to return an INTEGER_ARRAY.
   * The function accepts INTEGER_ARRAY grades as parameter.
   */
  public static List<int> gradingStudents(List<int> grades)
  {
        // Write your code here
  }
}
```

4. SQL Queries (should have valid MS SQL Server syntax)

Candidate:

CandidateID	Name	EmailAddress
1	Arsalan	arsalan@noemail.com
2	Ahmed	ahmed@noemail.com
3	Ali	ali@noemail.com
4	Sara	sara@noemail.com

JobPosting

CompanyName	PositionID	MaxSalary
COMPANY1	1	50000.00
COMPANY1	2	25000.00
COMPANY2	1	55000.00
COMPANY2	3	50000.00
COMPANY3	4	70000.00
COMPANY4	5	40000.00
COMPANY5	3	20000.00
COMPANY6	1	55000.00
COMPANY1	5	40000.00
COMPANY2	5	41000.00

Position

PositionID	Title
1	Software Engineer
2	Database Developer
3	Data Analysist
4	Data Engineer
5	Quality Assurance Engineer

CandidateInterest

CandidateID	PositionID
1	1
1	2
1	3
2	1
2	3
3	4
4	5

a. **Get a list of Jobs which each Candidate must apply based on his interest and considering that he must apply only where he can draw the maximum salary among all companies for that position. Following is an example based on the data provided: (8 points)**

CandidateID	Name	Title	Company	Salary
1	Arsalan	Software Engineer	COMPANY2	55000.00
1	Arsalan	Software Engineer	COMPANY6	55000.00
2	Ahmed	Software Engineer	COMPANY2	55000.00
2	Ahmed	Software Engineer	COMPANY6	55000.00
3	Ali	Data Engineer	COMPANY3	70000.00
4	Sara	Quality Assurance Engineer	COMPANY2	41000.00

b. **Display list of all candidates which have even candidate id and their name starts with the letter "A". (4 Points)**

5. Scenario

I. **What architectural design would you recommend?**
II. **Can Windows Service be incorporated in the project to resolve any of the feature?**
III. **In your solution, which type of service (web and/or windows) you would use and why?**
IV. **Consider you have made a SOAP based web service, the hackers are well versed in understanding and exploiting SOAP methods. To build extra security, what technique(s) you would use?**
V. **A day before the election, you ran performance testing and found that your server cannot support a lot of users simultaneously. What would be your approach to increase scalability of the system?**

BEST OF LUCK!