

Course Code: CS 423	Course Name: Information Processing Techniques
Instructor Name: Murtaza Munawar Fazal	

Instructions:

- Read each question completely before answering it. There are **4 questions and 5 pages**.
- 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 (Multiple options can be selected) **(15 Points)**

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

Question 3: Answer the following questions briefly.

1. Compare any four of the following (2 points each): **(8 Points)**
 - a. View Models versus Data Models
 - b. Select() versus SelectMany()
 - c. What is difference between ref and out variables?
 - d. Clustered Index v/s Non-clustered Index
 - e. Tier versus Layer

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

1. ABC Company is developing a university management system. You have been hired as a dot net developer with participation in each of the software development life cycle phases. Your initial task is to assist the team with some architectural design:
 - a. Considering your knowledge of the different types of distributed systems excluding Service Oriented Architecture, which one would you recommend and why? **(3 Points)**
 - b. Your higher management discarded your choices and opted to go for Service Oriented Architecture. You have been tasked to explain the positive as well as negative aspects of using Service Oriented Architecture for the type of system in discussion. **(3 Points)**
 - c. Your organization thinks that the positive aspects of using SOA is far more than the negative ones so they have decided to use that whereas now you have been asked to recommend whether they should use SOAP or Restful Web Service. **(3 Points)**
 - d. Explain three different types of proxies and discuss the usage of proxy class with distributed objects using a diagram. **(5 Points)**
2. Your company has approved the project and now you have been tested for the following challenges:
 - a. Explain the difference between Synchronous, Asynchronous and multi-threading with examples or diagram **(3 Points)**
 - b. Using code, how can we make lock and Monitor class to work identical? **(3 Points)**

- c. One of your team-mates wants your help. He wants to develop a method called ToJSON which can be used on the sealed Employee Class without modifying the Employee class. Discuss how can that be done? **(3 Points)**
- d. To keep the code generic, you recommended your team-mate to use reflection for the purpose of method converting to JSON but he wants you to write the code. Complete the following method which returns the object in JSON format irrespective of whatever the attributes are: **(5 Points)**

```
public static class GlobalMethods
{
    public static string toJson(this List<Employee> lstEmp)
    {
        // complete this function
    }
}
```

3. You and your team has completed all the prototypes and now you are focusing on creating the backend and connectivity with the database. Answer the following questions:
- a. What are the advantages of using LINQ? Is Lambda expression faster than query-based expression? Write a LINQ statement (Lambda Expression) to fetch students which were born in January? [Note: Students Object has DateOfBirth which is a datetime field stored in the format "dd/MM/yyyy"]. **(5 Points)**
- b. Your application will be storing binary files. Compare the blob approach (storing binary in database) and file system approach (storing path in database). **(3 Points)**
- c. Explain the four steps of writing to database using SQL File Stream functionality. **(3 Points)**
- d. How does Data Adapter differ from Data Reader? Explain the purpose of ExecuteNonQuery() when using Data Reader. **(3 Points)**
4. Your project already has a Web API Project created for the grading system. One of the clients i.e., a university has submitted change request with the following requirements: **(10 Points)**

- Our university is planning to change the grading policy as following:
 - a. Every student receives a grade in the inclusive range from 0 to 100.
 - b. Any grade less than 40 is a failing grade.
- Our teachers like to round each student's grade according to these rules:
 - a. If the difference between the grade (marks obtained) and the next multiple of 5 is less than 3, round grade up to the next multiple of 5.
 - b. If the value of grade is less than 38, no rounding occurs as the result will still be a failing grade.

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

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.

Write a Web API Method "GetUpdatedMarks" which will receive a list of marks as integer and will return list of integers as the output but with the new Marking.

Sample Input:
73 67 38 33

Sample Output:
75 67 40 33

5. Respond to the following SQL related questions. Following questions are based on MS SQL Server.
- a. Explain the difference between the variable type temp table (@tmp), single hash temp table (#tmp) and double hash temp table (##tmp). **(3 Points)**
- b. 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
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Following is the table structure:

Candidate:

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

Position

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

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

CandidateInterest

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

- c. Write a query to display StudentID and StudentName of all students which are not registered in any course. (without using subqueries). Following is the table structure. **(5 Points)**

Student
StudentID
StudentName

Course
CourseID
CourseName

StudentCourse
StudentCourseID
StudentID
CourseID

- d. Write a query which to fetch records from the student table based on the following conditions: **(4 Points)**
- Second character is either 'a' or 'u'
 - Any character between 'b' and 'f' cannot be the third character of the student's name.

BEST OF LUCK!