# National University of Computer and Emerging Sciences, Lahore Campus

| | | | | |
|---|---|---|---|---|
| | **Course Name:** | Software Quality Engineering | **Course Code:** | SE3002 |
| | **Degree Program:** | Software Engineering | **Semester:** | Spring 2022 |
| | **Exam Duration:** | 3 hours | **Total Marks:** | 100 |
| | **Paper Date:** | 29th Dec, 2022 | **Weight** | 40% |
| | **Section:** | 5A & 5B | **Page(s):** | 12 |
| | **Exam Type:** | Finals | | |

**Student : Name:_____ Roll No._____ Section:_____**

**Instruction/Notes:**

Attempt all questions on the question paper. Answer sheets are not required.
Take Assumptions where required and note them down along with your answers.

---

**Read the following requirements and answer Question 1 & 2 based on these requirements**

You are building a software solution '**SoMn**' for housing societies. You would like to sell this software to Co-operative housing societies management authorities to help maintain the records of plots and houses of the society. It also gives options to rent-out or sell a property. Here are few of its key features:

1. The software stores all the details related to available houses and plots. The Plot/Houses details includes
   a. Plot/Houses number
   b. Plot/Houses size (marlas/acres)
   c. For Sale (Yes/No)
   d. Available for rent (yes/no)
   e. House/Plot latest pictures
2. It also maintains records of the owners
   a. Current owner details (CNIC #, Name, Photo, Owner Since, contact number, plot/house number)
   b. Record(s) of all previous owners (if any)
3. Residents Details
   a. Current Residents (CNIC #, Names, Photo, Resident since, number of residents, Contact number)
   b. Previous Residents (if any)
   c. Residents Type (Tenant/Owner)
4. Some of the Operations:
   a. New plot/house details can be added only by Admin users.
   b. Plot/house details can be updated by Admins or the survey team members.
   c. Residents/Owner details can be added or updated by Resident's Support Team
   d. Residents can ask the Resident's support team to put the plot/house on sale
   e. Residents can ask the Resident's support team to put the house available for rent. A plot cannot be set to available for rent if its on Sale and vice versa
5. Integration with Zameen.com
   a. Your application integrates with Zameen.com to send data automatically about Plots/houses that are On Sale or Available for Rent
   b. It automatically sends and updates the details on zameen once the changes are made to Owner or residents of the respective property

---

**Question #1:[10+5+5+10+5+5]**

a) Decompose the application and create a microservice architecture of the system. Make use of load-balancer and Autoscaling to improve the system's availability. Draw a diagram to show the different services, load balancer and autoscalling of each service

b) What are different types of caching mechanisms that you can use at different layers of the application? Add them in the above microservice architecture to improve the performance

c) Which of the Information of plots, houses, Owners and Residents you will prefer to serve through static hosting using services like AWS S3 buckets. Draw the diagram to depict how the content will be served.

d) Currently, you are integrating only with Zameen.com. You know that later you will have to integrate it with other similar websites. How can you make your code easily extensible to add those integration later in the development lifecycle. Define and explain some extensibility requirements for the above system.

e) What are web vitals? How would you define the respective requirements for you system?

f) Define a few requirements that you will have to add to your system to make your web-application work in offline mode.

**Question #2:[5+10+5+10]**

    a) Create Equivalence classes for CNIC fields based on the CNIC format of a valid Pakistani NIC i.e. xxxxx-xxxxxxx-x where x is a digit.

b) Create 15 unique test scenarios based on the different operations mentioned in section 4 of the requirements.

c) Identify test Data that you would need prior to executing the above 15 test scenarios

d) Write one gherkin scenario outline to test the functionality to add a new record of an owner of house / plot based on the fields mentioned in the 2(a) section of the requirements.

**Question #3:[10]**

You have written a function that computes and returns an array of Fibonacci series (0,1,1,2,3,5,8,13,21,34,...). This function takes one integer parameter **n**, and returns the respective number of items in the fibonacci series. i.e.

- function(5) will return array of 5 elements from Fibonacci series [0,1,1,2,3]
- function(5) will return array of 0 elements from Fibonacci series []
- function(5) will return array of 7 elements from Fibonacci series [0,1,1,2,3,5,8]
- Returns an error in case of any non-integer value

Write proper unit tests for this function. (You can use any of your preferred language to write your unit test)

**Question #4:[10 + 10]**

    a) What is a Quality Management System? List any 5 mandatory requirements of ISO 9001

b) Explain following Product and Process Measurements matrices
   i) Process First-Pass Yield
   ii) Process Cycle Time
   iii) Problem Report Backlog
   iv) Bug Arrival Rate
   v) Defect Density