Assessment Paper **(60 minutes)**

Intern Software Engineer

Important Notes

This questionnaire is presented as part of the evaluation process for hiring interns at Avtra. You are not allowed to refer to the internet or any other sources while completing this paper. Your answer would be taken through a plagiarism detection tool to ensure work produced here is original and yours.

You may write your answers in a paper and you may scan or take photos of it from your phone and share it with the coordinator.

Questionnaire

You have been asked to develop a web based application for a library management system for your university which would be used by undergrad and postgrad students. Initially you are requested to support only borrowing books searching from a catalogue of books. Books made available are categorized by the semester and a given student may borrow books pertaining to his/her current semester only. While an undergrad student is allowed to borrow a book for a week, a postgrad student is allowed to borrow it for 2 weeks. Each student is uniquely identified by the respective Student ID. Title, author and published year are some of the important information made available for each book. Main functionalities you'll be addressing are,

a. Student login
b. Search book by title
c. Borrow a book

Question 01 (5 marks)

Explain **Abstraction**, **Encapsulation**, **Inheritance** and **Polymorphism** relating to examples from this library management system.

Question 02 (10 marks)

Come up with a simple **Relational Data Model** to support this basic library management system, assuming bare minimum to address the scope defined above only. State any assumptions you make clearly and make sure to denote primary keys, unique keys and foreign keys.

Question 03 (05 marks)

It is required to allow search for books giving full or partial title of the book with the option to filter popular books. Consider those books that are borrowed 5 or more times during the last months as popular books. Using the data model from the previous answer, prepare a **SQL query** to search all popular books having the word "*algorithms*" in the title.

Question 04 (10 marks)

Come with a simple **Class Diagram** identifying important classes, attributes and methods. Clearly note any assumptions you make.

Question 05 (10 marks)

In order to allow a certain number of concurrent users only using the library system at a given time, it is required to come up with a queuing system. For this, you are requested to come up with a generic queue implementation using only two stacks. Write a basic **Java program to implement the queue using two stacks**.

Question 06 (05 marks)

Explain the roles of **HTML**, **CSS**, **Javascript, Angular and React** in a web application.

Question 07 (05 marks)

Write a basic **login page with login form in HTML markup language**. Consider Student ID and password would be entered to login.

Question 08 (10 marks)

Provide short answers for the followings,

a. Abstract vs final class in Java
b. Static versus instance variables in Java
c. Various collections data structures in Java
d. When to catch exceptions and when to throw exceptions in a program?
e. Explain MVC pattern