00673

Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Information Technology/ Data Science

Final Examination
Year 3, Semester 1 (2023)

IT3030 – Programming Applications and Frameworks

Duration: 2 Hours

May/ June 2023

Instructions to Candidates:

- This paper has four questions.
- Answer all questions in the booklet given.
- The total marks for the paper is 100.
- This paper contains 4 pages, including the cover page.
- Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

Question 1 (25 marks)

1. Define what a software framework is in your own words. (2 marks)

2. Name three (3) software frameworks that you have used and explain the reasons for utilizing those rather than building a solution from scratch.

(5 marks)

3. A common habit among the software developers nowadays is to learn how to use a software framework rather than learning in-depth about the programming language the framework is based on (e.g., just learning to use the features of a JavaScript framework without an in-depth knowledge of JavaScript). Do you think this practice is good? Briefly discuss and justify your position with four (4) reasons.

(10 marks)

4. "Inversion of Control" is a concept widely associated with software frameworks. Explain with an example what this concept is and highlight how the flow of an application is impacted by utilizing this concept within a framework.

(8 marks)

Question 2 (25 marks)

1. Version control systems (VCS) are an indispensable topic in modern software development. Describe what version control systems are in your own words and highlight why it is important in the modern software development context.

(2 marks)

2. Compare and contrast Distributed version control systems (DVCS) with Centralized version control systems (CVCS). Clearly highlight the differences in approaches to version controlling in each method.

(4 marks)

3. Git is a very popular Distributed VCS. Even though Git repositories can function fully independently, users of related Git repositories tend to nominate one repository as the upstream or the remote repository and use it as a single source for updates. Why do you think this practice exists? Give reasons.

(6 marks)

4. Company X is a newly formed software company by five (5) developers. They just received their first project to develop an online marketplace, and the company has decided to use Git as the VCS for this project as it is very popular, even though none of the developers are familiar with Git. As of now, the developers have decided to store all their code on the main branch of both local as well as remote (upstream) git repositories. However, you have been asked to comment on their approach as an IT undergraduate.
    a. Do you see any issues with the approach they have decided to use? If so, briefly explain what they are. (4 marks)

b. One developer has read online that a git concept called "branching" can help them to avoid facing those identified problems. However, the other developers are quite skeptical of this, as it seems a bit complicated to use effectively. Discuss with an example based on a real-world software development environment, how you would convince the other developers of the benefits of using branching.

(4 marks)

c. To avoid complications with branching and to help with keeping the flow of daily development operations running smooth, the developers have thought to adopt a practice called Git workflows along with branching. Out of the existing Git workflows, GitFlow and GitHub flow have caught their attention as being suitable for their operation. Since GitFlow seems very comprehensive, they are thinking of using it for all their projects.

Considering the current status of the company, discuss and justify with reasons if using GitFlow is a good idea or not in your view.

(5 marks)

Question 3 (25 marks)

1. Briefly explain what an Application Programming Interface (API) is, and its importance in enabling communications and collaboration among different applications.

(3 marks)

2. Representational State Transfer (REST) is a very popular style of APIs nowadays. Briefly explain what REST is, and clearly highlight what makes an API, a REST API.

(4 marks)

3. "Stateless" is an important constraint in REST. Briefly explain this constraint, and then with an example clearly show how this constraint helps with scaling the backend (server-side) of a web application.

(5 marks)

4. Hypermedia as the engine of application state (HATEOAS) is an important constraint in REST.

   a. Briefly explain this concept in your own words. (2 marks)

   b. What are the benefits gained if an API aligns with the above constraint? Discuss briefly . (3 marks)

   c. With an example, clearly show the difference between a **response** from a fully REST compliant API vs. an API which is not REST compliant. You can assume that it is the same endpoint in the same system responding in both instances – in one instance, the system has a REST compliant API and in the other instance, it does not. You can also assume that both systems respond with JSON (JavaScript Object Notation). Please provide a small description explaining your example.

(4 marks)

5. "Keeping a REST API's endpoint naming consistent is a best practice." Do you agree with this statement? Justify your answer.

(4 marks)

Question 4 (25 marks)

1. Briefly explain the core DevOps principles.

(4 marks)

2. "DevOps is not just a software development methodology, but it's a complete change of an IT organization's culture." Do you agree with this statement? Justify your answer.

(4 marks)

3. The upper management in a large-scale product-based software company is considering introducing Continuous Integration (CI) and Continuous Delivery (CD) practices into the existing software process of the company in hopes of addressing the current issues it faces with delivery and deployment of software using the traditional waterfall model. Currently the company has separate teams for Business Analysts, Developers, Quality Assurance engineers and IT operations. As a senior engineer experienced in DevOps practices who recently joined the organization, you are asked to comment on this.
   a. What would be some common issues that they could be facing? Identify and briefly discuss these issues.

(3 marks)

   b. Do you think just the introduction of CI and CD would solve the issues they currently face? Critically discuss your views on the matter.

(4 marks)

   c. If your view is that just introducing CI/ CD is not enough to overcome the issues identified, what other changes do you propose to be made to the company's process to solve the issues that you identified? Briefly discuss the changes with reasons why each change is necessary.

(6 marks)

   d. Some members of the organization also think that the technology stack that is currently being used by the organization is outdated. Therefore, they suggest that the organization should ditch their existing technology stack completely and immediately adapt a cutting-edge suite of technologies to "future-proof" the software produced by the company. Should the organization do this? State your recommendations with reasons.

(4 marks)

End of the paper