IT3030 – Programming Applications and Frameworks

Duration: 2 Hours

Question 1 (25 marks)

1. Briefly discuss how software frameworks help in engineering good software.

   (3 marks)

2. Why should a software developer utilize a software framework rather than developing a solution for a given problem from the ground up? State three points on the matter with suitable examples to validate each point.

   (6 marks)

3. A commonly observed property in many software frameworks is that a developer utilizing a framework must follow the conventions set by the framework when working to develop a solution with the said framework. Do you think it is a limitation or not? Briefly discuss and justify your position with four (4) reasons.

   (10 marks)

4. Libraries and software frameworks are indispensable in modern software development. With a suitable example, discuss how libraries and software frameworks are applied in modern software development, specifically highlighting the differences between them in practical application.

   (6 marks)

Question 2 (25 marks)

1. Briefly discuss the importance of Version Controlling Systems (VCS) in modern software development environment in your view.

   (2 marks)

2. Critically discuss the reasons why second-generation VCS came into being noting their general characteristics, strengths, and any weaknesses.

   (4 marks)

3. Git is arguably the most popular VCS today. A "remote repository" is a concept that goes hand in hand with version controlling with Git. However, some consider that it is not mandatory to have a remote repository when using Git for version controlling. Do you think that is correct? Justify your position with appropriate reasons.

   (5 marks)

4. ABC is an established software development company having more than 300+ software developers. They have always been using SVN, a second-generation VCS as their default VCS for all their software projects. They currently have many large-scale projects running in parallel for various clients. They are about to start a new large-scale project in the next two months. Some senior technical persons in the company feel that it is time for the company to switch to Git from SVN for version controlling the software projects, starting with the new projects initially.

   a. As you see, what advantages would the company receive by switching to Git? Briefly state them.

   (3 marks)

   b. The new project to be started in the next two months (called project A) will require at least 20 technical professionals. There are Developers, Quality Assurance engineers (QA), IT operations (IT-Ops) professionals in this team who will carry out various operations to meet project goals. The company plans to use Git as the VCS in this project as an experiment.

   However, none of these professionals have much experience with Git in a large-scale team collaboration effort. In their search for a solution to overcome any potential issues the team might encounter in day-to-day operations they have encountered a concept called "Git workflows."

   Out of the workflows that you know, what would you recommend to this team to adopt, considering all the facts? Briefly explain the workflow you recommend, identifying its key features. Justify your answer by clearly highlighting the benefits of adopting the recommendation you make.

   (7 marks)

   c. "Make small, incremental changes" is a Git best practice. Why is it considered a best practice? Give reasons.

   (4 marks)

Question 3 (25 marks)

1. With a suitable real-world example discuss how Application Programming Interfaces (APIs) help to improve collaboration and connectivity across many different applications.

   (3 marks)

2. Representational State Transfer (REST) is a very popular style of APIs nowadays. Discuss three reasons for its popularity.

   (3 marks)

3. "Cacheable" is an important constraint in REST. Briefly explain this constraint, and with an example clearly explain how this constraint promotes improvements in user perceived performance of a web application.

   (5 marks)

4. Richardson Maturity Model (RMM) is a four-level scale that indicates the extent of API conformity to the REST constraints.
   a. Briefly explain the RMM model with the help of a diagram.

      (2 marks)

   b. Can an API classified as being in Level 1 in the RMM be considered a REST API? Briefly discuss your position with reasons.   (4 marks)

   c. With an example, clearly show the difference between a **response** from Level 3 API in RMM vs. Level 1 API. You can assume that it is the same endpoint in the same system responding in both instances – in one instance, the system has a RMM Level 3 API and in the other instance, it is a RMM Level 1 API. You can also assume that both systems respond with JSON (JavaScript Object Notation). Please provide a small description explaining your example.

      (4 marks)

5. It is not mandatory to accept and respond with JSON for an API to be a REST compliant API. Still, it is considered as a best practice to do so. What would be the reason for this? Discuss briefly.

   (4 marks)

Question 4 (25 marks)

1. State the core DevOps Principles. (4 marks)

2. Critically discuss why the traditional model of software development and deployment was not successful, identifying the main problems with the traditional approach and how DevOps approach addresses the said problems successfully.

   (6 marks)

3. A large-scale product-based software company is plagued with the problems you identified in the previous question as they have so far followed a traditional approach in developing and deploying their software product.

   a. Do you think they would be able to successfully adapt DevOps practices to their company as it is? Discuss your position with reasons.

      (4 marks)

   b. Some in the company think DevOps is just another fancy term for Continuous Integration/ Continuous Delivery and Deployment (CI/ CD). Is that correct? State your views on the matter with appropriate justifications.

      (6 marks)

   c. Some members of the organization think that the monolithic architecture of their software product is outdated and that hinders the adoption of DevOps. They suggest an immediate adoption of new architecture such as Microservices, to easily adopt DevOps tools and practices. However, another group of members thinks that Microservices is completely unnecessary as the product is currently doing fine and there is no hard requirement to do adopt Microservices when choosing DevOps. Whom do you agree with given the situation? Justify your position with reasons.

      (5 marks)

End of the paper